TELEPHONE ENGINEER

VOLUME 29 AUGUST, 1925 Number 8

INDEPENDENT GENERAL STAFF IS FUNCTIONING

That a general staff organization in the Independent telephone field has been brought into existence and is functioning actively has been demonstrated in effective fashion by the recent accounting conferences of Class A, B and C companies at the various district centers. The splendid attendance at these conferences show the wisdom of the national association officers in selecting locations that might be reached without undue expense by officials, even of the smaller companies, and the close attention to the programs and discussions was evidence of the interest of the company executives and accountants in the work that is being done.

Many of the company executives were surprised at the comprehensive data presented, and, without doubt, some of them found that the association had made even a more complete study of the operating results of their companies than they themselves had made. As was to be expected, variations in accounting practice were found, and it is to be hoped that the discussions will result in a closer study of accounting by the various companies so that more uniform procedure will be developed.

The industry owes a debt of gratitude to the officers of the national association and to the chairman and members of the accounting committee who have spent a great deal of time and effort in order that this work may be carried on. It is to be regretted that there are, still, a few Independent companies in Class C, and even larger classes, that have not as yet shown their co-operation even to the extent of taking membership in the association, much less making financial contributions that will enable the work to be carried on and extended into broader fields.

EDUCATING THE FARMER-SUBSCRIBER

Numerous comments reaching this office indicate that telephone men are giving serious thought to the possibilities of association advertising, with a view of educating the farmer to an understanding of the cost of telephone service. Naturally, there are differences of opinion as to how the campaign might be carried out, but there seems to be no dissent to the proposition that such education is necessary and that advertising in papers which reach the farmer is a practicable means for disseminating the facts.

In commenting on our editorial, the "Indiana Telephone Bulletin," organ of the Indiana Telephone Association, calls attention to the good which may be done by each company advertising in the papers published in the locality served by it. There is no question as to the value of advertising in the local papers and many progressive telephone companies are using space regularly to tell their subscribers the facts about their business. Few, if any, telephone companies are using too much space in local papers and the vast majority are using entirely too little.

We do not find ourselves entirely in agreement with our Indiana friends, however, in the idea that the entire field may be covered in this way. The local telephone company can do much good in its own territory and many of them already have educated the farmer to the point where he is paying somewhere near an adequate rate, but such advertising will fail to reach a large mass of farmers in territory served by less progressive companies, and in mutual association territory. Many excellent sermons never have converted even a single sinner for the very simple reason that the sinner was not present to hear the sermon. Many small towns do not have a local newspaper and most of the subscribers of the smaller companies are not reached by the individual advertising of the larger companies.

The plan proposed was not meant as a substitute for local advertising by individual companies and we are sure that the telephone manager responsible for the suggestion had no such thought in mind. It was proposed, rather, as a means of reaching many who do not get local papers, and the farm journals seem to be an available medium for such advertising. We have no doubt that such a campaign, carried out along proper lines, would be productive of very great good to all telephone companies that serve farmer subscribers.

RATES FOR SEASONAL SUBSCRIBERS

There are certain exchanges where the problem of telephone operation is complicated by a seasonal demand for service. Such exchanges are in localities frequented by large numbers of people who spend only a portion of the year there. In summer and winter resort places, the seasonal demand for telephones is sometimes double or triple the all-year-'round demand. In such places, plant sufficiently large for the peak demand must be constructed and maintained, only to stand in idleness for two-thirds or three-fourths of the year.

Telephone companies operating exchanges of this type must adopt one of three alternatives: They must operate the exchanges at a loss, must charge year-'round subscribers a high rate to cover the carrying charges on idle plant, or must charge a special rate to seasonal subscribers so that they bear the added cost. Obviously, the third is the only fair plan, but it is one which involves some difficulties of administration.

In a recent order of the New York Public Service Commission, the New York Telephone Co. was authorized to place in effect a charge for seasonal service which provides a minimum charge equivalent to the charge for seven months' service. Where the service is retained for a longer period, the regular rates apply. Another company, having a considerable volume of summer resort business, requires the deposit of a sum equal to three months' service charge, in addition to the usual installation charge. This sum is retained by the company and the usual monthly bills are paid by the subscriber for the first three months. If the service is retained for longer than three months, the deposit is applied to the payment of rentals. This plan has the effect of insuring the company at least three months' revenue and has the added advantage that the subscriber can not leave with an unpaid bill. No refund is made, but if the service is retained for longer than six months after the deposit is exhausted, the regular rates apply.

The time for the adjustment of inequalities which now exist is during the off season. Companies having seasonal demand will find that the best time to prepare for next season is immediately after the close of the current season. Schedules then may be prepared and authority to install may be obtained so that all will be in readiness when the new season opens.

DISCOUNT DATES A MATTER OF MANAGEMENT.

In a recent decision of the Federal District Court of the Eastern District of Kentucky, in the case of a gas utility, the question of the amount of discount and the length of the discount period for prompt payment of bills is discussed at some length. The opinion of the court is "that the amount of discount or the length of the discount period is, primarily, a matter of internal management with which the Commission is not directly concerned." Later, the decision says, "What allowance the company will make for prompt payment should be universally applied, so as not to create discrimination, but a rate which is less than the maximum which the company could charge to the dilatory consumer would not seem to be extortionate. The function of the commission is to provide against extortionate charges to any and all consumers, whether prompt or dilatory in payment, and the Commission is not concerned with questions of internal management beyond this point."

The situation in the telephone industry is somewhat different than in the gas industry in that gas consumers are billed after the service has been rendered while telephone subscribers, usually, are billed in advance. Most telephone rates have been established on the basis that the net rates are to provide an adequate return, if prompt payments are made. Following the logic of the decision just mentioned, it would seem that the gross rates might be determined by what the company considered to be a sufficient difference to insure prompt payment. The difference in many cases has been so small and the length of the period before the gross rate was applied has been so long that practically no benefit has been derived in the form of prompt collections, or increased revenue from slow-paying subscribers. If the matter is one of internal management, the management should see that the discount and the period are of such dimensions that the desired result is attained.

TELEPHOTO TRANSMISSION DEVELOPING COMMERCIALLY

The commercial importance of the transmission of photographs by wire is becoming more apparent as new uses develop. Many newspapers have used the service and uses of the system for transmitting printed and written documents are being sent.

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Fighting Off Electrolysis

A Continuation of Our July Article on This Important Topic—Further Suggestions Respecting Corrosion of Underground Cable—Some of the Contributing Causes, and Most Efficient Remedies

By P. KERR HIGGINS

A correspondent asks for information regarding corrosion of underground cables, in addition to information regarding electrolysis. Corrosion of buried cable was fully discussed in Vol. 29, No. 2, of TELEPHONE ENGINEER February, 1925. The correspondent is referred to that article, but some additional information may be given here:

Corrosion and electrolysis are, more or less, similar and the indication, usually, is pitting of the sheath or a covering of white deposit. When the pitting is sufficiently deep to penetrate the lead sheath, moisture enters the cable and lowers the insulation, producing a partial or complete ground.

Lead sheaths of telephone cables have extremely low resistance to electrical currents. An idea of the conductivity of the lead sheath of a telephone cable may be obtained from the fact that one thousand feet of 400 pair No. 22 B. & S. gauge cable has a resistance of approximately one-eighth of an ohm. If rail bonding is defective the low resistance of the cable offers an inviting path for the trolley return currents, even if the cable is at some distance from the track. It cannot be emphasized too strongly that, so far as possible, every effort should be made to prevent the current from entering the cable sheath and for such current as enters in spite of precautions it is necessary to provide a metallic path for the current where it leaves the cable. The complete protection of a cable system requires eternal vigilance on the part of the electrolysis inspector. Bonding, at best, is only a palliative measure and can never permanently cure the trouble. A system of cable bonding which may be reasonably safe today may prove inadequate next year when a few broken bonds in the railroad track may cause an aggravated renewal of the trouble. Broken bonds are frequently the result of oxidization and before the fracture is complete a high resistance joint may develop which is often more difficult to locate than an actual break. Partial protection from the entrance of stray current from trolley systems is furnished by clay, tile, stone, cement or creosoted wood conduit and in the case of buried cable by a liberal coating of Ever Protect Compound.

Origin of Electrolytic Currents

The importance of this subject makes necessary a thorough understanding of the origin of electrolytic currents and it may be of advantage to amplify the explanation somewhat beyond the general consideration given in the previous article. If any electrical pressure exists between any two points of the ground, electric current will flow because the resistance is never infinite. When cable is stretched between two such points current will travel along the sheath of the cable. Electric pressure which creates the current flow may be due to one or more of many different causes. An electric power system may be badly insulated at two or more points; water and gas pipes may reach into soils of different chemical composition so that differences of potential exist on long electric conductors such as rails of street car systems may permit leakage to the ground. It is therefore obvious that while the traction company is usually the cause of electrolysis trouble there may be other causes and this should be carefully investigated to determine the cause before making the complaint.

In applying the bonding remedy, great care must be taken that cables are not made too strongly negative to ground, but just enough always to be sure that they are not positive. If too strongly negative there is danger of arcing where the cables touch other good conductors in the neighborhood. It is not possible to say just what negative potential may be considered as dangerous as this depends on the current flow and the chemical composition of the substances formed on the cable sheath. At the extreme ends cables may be highly negative and yet carry practically no current; hence no trouble might be caused by this highly negative condition. However, in the main cable leads carrying heavy currents, a very few volts may be a very harmful condition. The more negative the condition of the cables, the greater the amount of current that will be picked up by the cables from the surrounding earth; hence it is necessary that the underground system be made no more negative than possible and at the same time have absolutely no positive condition.

Intensity of Electrolytic Currents

It is well to remember a deposit of one-fourth ounce of lead will be made by one ampere of current flowing for one hour from a lead electrode. The damage to the lead depends, of course, largely upon the surface from which the current escapes. A one-foot length of cable sheath 6 inches around and ⅛-inch thick will weigh about 2½ pounds, or 40 ounces. Assuming a current flow of .01 amperes the current escaping per foot of cable (assuming a 26,000 foot length) would be:

$\frac{1}{100 \times 2{,}600}$ in a year, or about 8,600 hours, causing a total deposit of $\frac{.25 \times 8{,}600}{100 \times 2{,}600}$ ounces of lead. That is about $\frac{8}{1{,}000}$ ounces will be dissolved per foot in year. While this is simply an illustration it is evident that small currents like this are not liable to cause any trouble even if they flow for long periods. If, however, readings show that the whole 1/100 of an ampere escapes within a length of ten feet, by applying the above rule to the last case it will be found that two and one-tenth ounces are carried away per foot in year. It is therefore important to watch closely the intensity of the escaping current per foot length of the cable sheath.

Direction of Electrolytic Currents

The tendency of all leakage current is to flow toward the power house and experience shows that usually the greatest trouble is found in the neighborhood of the power house, but not always. It is in this return of the current from the street car to the power houses that the current is constantly seeking to find the best conductors en route. Where there is much traffic, the rails are supplemented by large copper wires leading back to the negative busbar of the dynamo. Frequently, however, the current leaves the rails and finds other paths. If a telephone underground cable runs parallel with a street car line for a given

distance and then leaves the line at right angles or crosses under the street car tracks, the current on the cable is apt to leave the sheath and take a direct run to the power house. Where this happens trouble may be expected. The wetter the earth the more it attracts the current from other conductors to itself. It is well to remember that the polarity of the dynamos may be changed at the power plant or additional tracts or extensions made or additions or changes made to the existing telephone system. All of these things have a very material bearing on the situation and could change an otherwise good condition to a very bad condition.

Rail Resistance

The conductivity of iron about the hardness of street rails measures about thirteen times as much for the same cross section of copper. The resistance of single seventy pound rail will be approximately .084 ohms per mile and such a rail is equivalent to a copper wire of approximately 671,825 circular mils. The two rails in parallel will measure .042 per mile, not including the resistance of the bonds, which in practice will just about double the total track resistance. By means of the "Thermit" weld bond the joints can be made approximately equal in conductivity to the rail itself.

Earth Resistance

It is a difficult matter to give accurately the resistance the earth offers to the passage of the electric current as it is apparent that the resistance of a path through the earth is not always dependent on the distance, but on the character of the ground and the grounding points or plates. Rods of one inch diameter driven five or six feet in good earth would have an average resistance of fifteen ohms. A measurement taken between two such rods at a distance of, say, five miles apart was about thirty ohms and the same resistance was obtained with a measurement of two rods twenty-five miles apart. The contact with the earth is also important as may be noted from the fact that an iron rod made to rest on the earth showed readings of from 500 to 7000 ohms, while at a depth of twelve inches an average resistance of thirty ohms was obtained with a one inch rod. Experiments made by Dr. Michalke in France show that with ordinary street construction a section of track one-eighth of a mile long will have a resistance to earth of about .25 of an ohm and this may be taken as the best factor in making calculations. Due to the fact that lead cable presents a smaller surface area than the rail, it is estimated that this resistance will be greater than the rail or, say, .5 ohms. Then the total resistance from cable to rail will be the sum of these two resistances or approximately .75 ohms.

Resistance of Cable Sheath

Taking the circular mil foot resistance of lead to be 117 ohms it is easy to calculate the total resistance of a mile of cable sheath. Taking, for instance, a 600 pr. cable, the outside diameter of the sheath is approximately 2¾ inches and the inside diameter 2½ inches. The cross section then would be 1.0308375 sq. in. The cross section of one circular mil is .0000007854 sq. in. Then the area in circular mils of cable sheath will be 1,312,500 circular mils and one mile of cable sheath of this size would equal .4707. The resistance for various sizes of cable are shown in Table 1 and the same information is given in graphical form in Fig. 1.

Bonding Cables

It is obvious that no advantage is gained in putting down bonds having

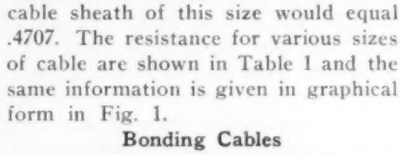


Fig. 1—Lead Sheath Resistance Curve.

greater conductance than the cable sheaths themselves, which are to be protected; furthermore, large stray currents are not being effectively prevented from entering telephone cable plants and underground metallic structures due to improve construction in modern street railroad track and power plant methods. The selection of bonds of proper capacity is not quite as simple as might be supposed. Each individual case must be treated according to local circumstances and the size determined from milli voltmeter measurements and cable sheath resistances for each point affected. The rule used is rather complicated and while not necessary to discuss in an article of this kind, may be summarized as follows: The resistance of a conductor is expressed as proportional to its length and inversely proportional to its area or cross section.

When a number of cables run together in a given direction, and are subject to electrolytic action at or near the same point, the sheath resistances should be ascertained and the currents traversing them calculated for each separately. The sum of these separate currents will enable us to determine the required size of bond. The path of return must, however, be large enough to secure the desired results, namely, rendering the exposed district electro-negative, yet not too large as to invite an excessive amount of current to flow along or through the sheath. It is also important that no connection will be made which will invite current to travel along the cables rather than go some other way. With very large currents flowing into the sheaths, there is danger of overheating. There is also danger of injury to the cable sheath due to the action of the alkaline substance formed around the cables through the decomposition by the current of the soluble salts contained in the ground. These alkaline substances under favorable conditions are likely to attack the lead when the current is shut off or reduced, e.g., at night.

The following table gives the approximate carrying capacity of cable sheaths under normal conditions and the amount carried should not exceed the amount shown in amperes for the various sizes:

25	pairs...22	gauge	40 amperes
50	pairs...22	gauge	50 amperes
100	pairs...22	gauge	70 amperes
200	pairs...22	gauge	100 amperes
100	pairs...19	gauge	100 amperes
300	pairs...20	gauge	125 amperes
300	pairs...19	gauge	155 amperes
400	pairs...22	gauge	135 amperes
600	pairs...22	gauge	155 amperes

It is well to remember that the current flowing should be measured when the load is at its maximum peak. It is also well to remember that stray currents will follow the sheath of aerial cables usually entering and leaving by means of the anchors unless the anchor guy wires are located separate from the messenger strand carrying the cables. If this cannot be arranged, then a strain insulator should be inserted in the guy strand.

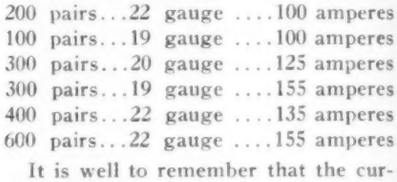


Fig. 2—Correct Method of Dead-Ending.

The best plan is to dead end the strands on separate strain plates. Fig.

2 shows the right way and Fig. 3 the wrong way of dead-ending.

Where bonding and grounding is necessary in localities distant from the power house, a ground plate may be installed instead of drainage wire. These plates may be made either of cast iron or zinc. The only objection to this practice is that the places are

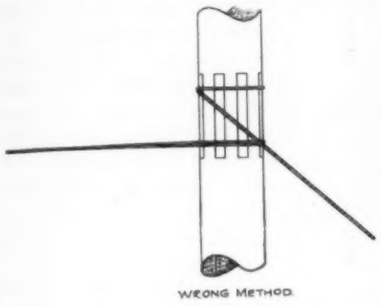


Fig. 3—Wrong Method of Dead-Ending.

gradually decomposed and require constant watching. Iron may be used for this purpose if a potential between the cable sheath is more than three-tenths of a volt. If the potential is lower than this, zinc ground is preferable. Fig. 4 shows a method of attaching the bond to the cable ahead.

Telephone Cable Sheath and Bond Data

TABLE I.

Cable size Pairs.	Sheath Diam. inches.	Sheath Thickness inches.	Sheath Area sq. ins.	Ohms per 1,000 ft.	Equivalent Copper Bond B. & S. Gauge.
1	0.280	.06	.0415	2.255	14
3	0.350	.06	.0456	1.715	13
5	0.380	.07	.0681	1.375	12
10	0.465	.07	.0995	1.075	11
15	0.525	.07	.0995	0.940	11
20	0.600	.07	.1165	0.804	10
25	0.660	.08	.1455	0.645	9
30	0.695	.08	.1543	0.606	8
50	0.820	.08	.1860	0.503	7
75	0.980	.09	.2510	0.373	6
100	1.090	.09	.2825	0.332	5
150	1.275	.10	.3690	0.254	5
200	1.460	.10	.4270	0.219	4
250	1.630	.10	.4800	0.195	3
300	1.780	.125	.6500	0.144	2
350	1.910	.125	.7000	0.134	2
400	2.000	.125	.7360	0.130	1
500	2.250	.125	.8340	0.112	1
600	2.430	.125	.9040	0.104	0
800	2.750	.125	1.030	0.090	0

Vibration of Cables

Another cause of lead disintegration which is not caused by electrolysis but which may be discussed briefly is vibration of the cable sheath. Vibration usually operates in conjunction with other causes. The name for common lead ore is "Galena" and its structural form is supposed to be cubical crystals; the lead carbonate structural form being rhombric crystals. A drop of molten lead if allowed to cool undisturbed shows a crystalline form under a microscope; hence lead may be said to be crystalline by nature, having no fiber such as we find in wrought iron, but being rather more like cast iron, which is made up of small granules. Nearly all metals are capable of crystallization by partial freezing, having alternate expansion and contraction in addition to and together with vibration. Both tin and lead are malleable, but not ductile, and an amorphous solid body (one with no definite structure) may also undergo partial crystallization by re-arrangement of the molecules, thereby giving it a more or less complete crystalline structure.

Crystallization in aerial telephone cables is usually due to freezing, contraction and expansion, together with vibration, assisted by the sulphur dioxide in the air and by stray currents in the lead sheath due to leakage or induction from parallel high tension circuits. By grounding the cable sheath to the messenger, the effect of the stray currents may be considerably minimized. Since lead is cubical in form and malleable, but not ductile in nature, the constant stretching of the cable sheath in conjunction with vibration and the chemical action of the atmosphere reforms the molecules again into small cubes which previously had been distorted when pressed into a homogeneous mass of lead. The tendencies toward vibration are usually caused by—

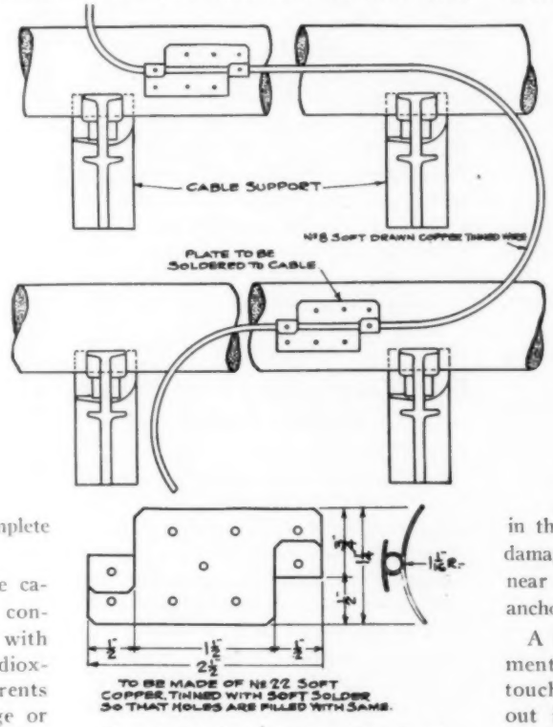

CABLE SUPPORT
No 8 SOFT DRAWN COPPER TINNED WIRE
PLATE TO BE SOLDERED TO CABLE
1½"R.
½"
1½"
½"
2½"
TO BE MADE OF No 22 SOFT COPPER TINNED WITH SOFT SOLDER SO THAT HOLES ARE FILLED WITH SAME.

Fig. 4—Method of Attaching Bond.

1. Too much slack in the messenger wire.
2. Too little slack in the cable.
3. Being suspended to or from vibrating structures.
4. The use of too long spans.

It has been observed frequently that after a period of two or three years, considerable sag is noticed in the cable span. If at this time the messenger is again pulled taut several feet of cable will be left which will either have to be cut off or a new splice made. This demonstrates how much a sheath is liable to stretch and being unable to go back again by contraction, the small molecules of lead form themselves into little cubes which immediately develop crystallization.

Corrosion must not be confounded with crystallization—the former is shown in the form of pitted holes, while the latter appears as small cracks in the sheath. The stretching of the cable in conjunction with the amplified swing of the span in the wind causes a bending to and fro of the cable which eventually opens up these miniature cracks in the sheath. It will be noted that the damage due to vibration is usually greater near the points where the cable is anchored.

A study of stringed musical instruments shows that if a string is touched a vibration is set up throughout its entire length and the sound produced is known as the true note of

the string. However, there is also set up at the same time a series of harmonics or intermediate vibration acting independently, but in concert with the end to end vibration. Due to this fact there occur intermediate quiet points or nodes between the harmonics equidistant throughout the entire length of the string. We may therefore compare the cable to that of a musical string, and having this in mind we may be able satisfactorily to account for breaks at a distance from the ends of a cable.

It is a well known fact that the continuous bending of lead will produce fracture. Too little slack in the cable itself is usually considered a serious defect in construction, as no allowance is made for contraction and expansion. Lead has a very high co-efficient of expansion and contraction, which changes in temperature, being much like copper wire in this respect. When a cable has been strung in summer with little or no slack the natural result is a contraction of the lead with the coming of winter which causes trouble. The use of long spans intensifies the peculiar phenomena mentioned above. Cables suspended from vibrating structures such as bridges, elevated roads, etc., are very liable to danger. Also when supported to poles carrying trolley spans trouble may be expected.

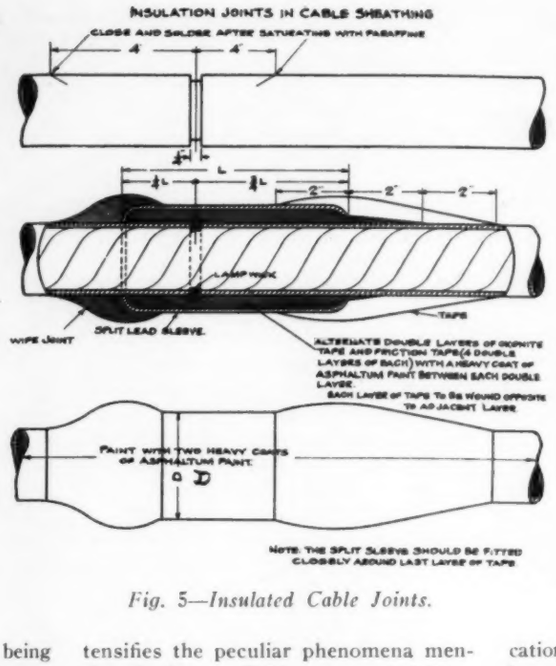

INSULATION JOINTS IN CABLE SHEATHING
CLOSE AND SOLDER AFTER SATURATING WITH PARAFFINE
4'
4'
L
2'
2'
2'
LOOP HOOK
TAPE
WIPE JOINT
SPLIT LEAD SLEEVE
ALTERNATE DOUBLE LAYERS OF IRONITE TAPE AND FRICTION TAPE (4 DOUBLE LAYERS OF EACH) WITH A HEAVY COAT OF ASPHALTUM PAINT BETWEEN EACH DOUBLE LAYER
EACH LAYER OF TAPE TO BE WOUND OPPOSITE TO ADJACENT LAYER
PAINT WITH TWO HEAVY COATS OF ASPHALTUM PAINT
D
NOTE: THE SPLIT SLEEVE SHOULD BE FITTED CLOSELY AROUND LAST LAYER OF TAPE

Fig. 5—Insulated Cable Joints.

Fig. 6—Motion of Suspended Cable.

Fig. 6 gives a diagramatic sketch representing the motion of a suspended aerial cable. It also shows the natural motion of the cable in its fundamental and harmonic vibration. The use of sheaths heavier than the so-called standard is advocated by many large operating companies, who claim that money so spent is well invested. However, such a remedy only lengthens the time of the injury, as no thickness of lead will render cables indestructible, as it is only a question of time until they are finally attacked from some cause, either vibration, decomposition or corrosion. It is well to remember that the application of remedies, some of which have been suggested, will minimize trouble, but cannot prevent them entirely. Nearly all cable trouble is due to some local condition; hence the cause must be found, located and then the remedy applied.

London - Paris Toll Operators Trade Jobs for Training

London, Eng.—Paris and London are now exchanging telephone girls in relays for periods of two weeks in each city, in order to increase their efficiency in the routing of long distance calls.

The scheme applies, so far as the English telephone girls are concerned, only to those engaged in the operation of the Anglo-continental telephone lines, and at present it is not contemplated to make a similar arrangement with other foreign capitals. French is the official language of the Paris-London line and, in fact, many of the English operators have been educated in France and most all of them speak French fluently. To give the girls a working knowledge of the two exchanges and the method of routing calls, the English girls will work in the French central offices at the same time the French operators will be employed at the London end.

New York City.—Telephone men who are football fans, and there are thousands of them, have one of their number, E. K. Hall, vice president of the A. T. and T., as chairman of the football rules committee.

C. B. Ford Buys Out Flickinger at Kingfisher, Okla.

Kingfisher, Okla—Controlling interest in the Kingfisher Telephone Co. formerly held by M. M. Flickinger was transferred August 1st to C. B. Ford, formerly General Manager of the American Telephone Co. of Holton, Kansas.

Mr. Ford is moving to Kingfisher August 15th, and will succeed Mr. Flickinger as President and General Manager. Meanwhile the property is under the management of Mrs. Lulu Shaw Grimes, who has assisted Mr. Flickinger in building the plant up to its present size and efficiency and who is being retained by Mr. Ford.

Fort Meyers, Fla., Cuts in New Kellogg Board

Fort Meyers, Fla.—With less trouble than he ever before experienced, J. E. Wright of the Kellogg company supervised the cut-over of the Fort Meyers company to its new equipment, according to statements credited to Wright by local newspapers.

Iowa City, Ia.—Approximately $50,000 is to be spent on improving the local telephone system.

Indiana Bell Increases Capital Stock

Indianapolis.—Increase of capital stock by an issue of $12,000,000 in common stock has been voted by stockholders of the Indiana Bell Telephone Co. This stock when issued will bring the company's outstanding common stock to a total of $27,000,000. The new stock will be sold to the American Telephone and Telegraph Co. at par. Proceeds from the sale will be used for the purchase of the general office building now occupied by the company in Indianapolis and for the payment of maturing obligations. The company's office building has been owned by the parent company by which it was erected in 1907 for the Central Union Telephone Co., predecessor of the Indiana Bell Telephone Co.

Bowen Interests Get Another Georgia Company

Fitzgerald, Ga.—The Bowen Telephone company has bought the Nashville, Ga., Telephone company from W. A. Moore. The Nashville company has approximately 200 stations. Exchanges now owned and operated by the Bowen company are at Fitzgerald, Alapaha, Ocilla, Nashville, Abbeville, Alma, Rochelle and Rebecca.

Keeping Track of Material

A Difficult Problem for the Small Company Is the Handling and Accounting of Material. A Practical Telephone Manager Tells of a System That Works

By M. L. CLAUSER

Material is one of the most important items that enter into the construction and operation of a telephone plant. Without a constant supply of material, operation would of necessity have to be suspended. The cost of material is one of the major items of expense and enters into various accounts of a properly kept system of accounts of a telephone company.

Let us first consider the value to a small telephone company of properly accounting for material used.

The time was when it was thought that the chief purpose of accounting was to protect the employer from the possible dishonesty of those entrusted to handle property entrusted to their care. This may sometimes be important but it is only one of the many services rendered by adequate accounting.

Accounting of material provides a means of keeping a record of all material in stock, showing when some article needs to be replenished and also acts as a preventative to misuse, because of the variety of detail and the possible sources of leaks and losses. We can remember when a telephone company kept only the most simple accounts and if the receipts were more than the expenses the company was supposed to be operating at a profit, while in reality service was being furnished at less than cost, the company's poles, lines and equipment, wearing out, necessitating replacement at some future time.

A company that adheres to this method will find that its records are so incomplete as to be of little practical value.

The larger telephone companies have their accounting procedure carefully arranged and followed; by frequent revisions have kept their methods so as to conform with the progress of the telephone art.

However, this has been neglected to a great extent by the smaller companies, due to the fact, perhaps, that the management failed to appreciate the importance of proper accounting and the hesitancy to make the necessary expenditure, looking upon accounting as an unproductive overhead expense which might be considered at some future time. This has resulted in financial difficulty, failure on the part of the owners to secure a fair return on their investment, difficulty in rate cases, capitalization and tax matters.

Accurate accounting of material is essential and important because of the various accounts involved, as classified by the Public Service Commission affecting, as it does, the plant or investment accounts, the income or loss as shown in the maintenance accounts and replacements, which are taken care of out of the depreciation reserve.

Material improperly or not at all accounted for will so affect the accounts of the company that when the unit costs are compiled at the end of the year, the results will be very misleading, unreliable and of but little more value to the company than if no accounting had been attempted.

To get results a system must be followed and those who handle the system must be accurate in details and understand what is to be accomplished by the system.

It is very obvious that a system as used by a large company would be too top-heavy and the cost of maintaining too great for a small telephone company. Yet the system must be accurate and easy to apply, one that will fit in with the daily routine of the repairman, because in a small telephone company the repairman is generally the custodian of the material, and it is he who must record all material used or returned to stock. This record should be made day by day. He should at all times work in harmony with his fellow workers, for it is only by so doing that the best results can be accomplished. He should educate himself to the end that he may render accurate and efficient service in accounting for all material entrusted to his care and understand the necessity and the value to the company, of his so doing.

The store-room should be provided with shelves, bins and boxes, so that the various articles may be kept in place and so arranged as to be easy of access. This arrangement conserves time, prevents material from becoming lost through misplacement and facilitates invoicing.

Invoices of all material purchased and not immediately used and charged to plant or operating expense accounts should be recorded in a stock record, each article recorded on a separate sheet designating such article. This record should show the date purchased, from whom, the voucher number of the invoice, the quantity, invoice cost, to which is added the freight and drayage, giving a total cost which is reduced to a unit cost.

This part of the stock-record may be considered, and is, the debit side of the material and supply account, and the total cost of the various articles recorded should agree with the debit side of the general ledger account.

It is necessary to have a foundation upon which to build any structure or system. In this instance it is the trouble ticket. It plays a very important part in systematic accounting for material used. It should show the nature of the work done, the time required and the amount and kind of material used. It should be completed at the time or soon after the work is done, thereby eliminating the possibility of mistakes and forgetfulness. When the day's work is done it is a matter of only a few minutes to summarize the amount of material used as shown by the trouble tickets and record the totals on the daily work-report.

This report shows the repairman's work for each day summarized and should be given to the company's accountant each day along with the trouble tickets. The accountant should check up the trouble tickets to see if they correspond with the work-report.

It is practical in some instances, where such material as is used almost every day, to charge same out in quantities, not greater than the amount that will be used during the month in which the article is taken from stock.

The work-report for each day shows, as taken from the trouble ticket, for what purpose the material was used, a repair, replacement or new construction. This is very essential, for in the first place a repair is an operating expense; in the second, a replacement is a charge to depreciation

reserve, and the third, construction is a plant account. It is very evident that material used and improperly charged during each month might very materially affect these accounts at the end of the year.

At the end of each month the various articles of material used, as shown on the daily work-report, are classified and summarized, the totals charged to the various accounts involved. The material used, in total of each article for the month, is recorded on the used portion of the stock-record, which shows the date, reference, quantity and value as compiled from the unit cost. This part of the stock-record corresponds to the credit side of the general ledger material and supply account. The difference between the received and used quantity, of any article, shows the quantity of the commodity in stock.

The total of the differences of all commodities in stock should agree with the balance as shown by the material account of the general ledger.

It is human to err and it would be unusual to find, at the end of the year, that the stock-record, the invoice and the general ledger account did agree as to the amount of material in stock. It then becomes necessary to make some adjustments on the books of the company in order to take care of the differences, which should be very small.

Small telephone companies generally sell material, especially batteries. There should be provided a sales slip, giving the date, name of party to which material is sold, kind of material and price. From these slips the sales for the month are totaled and noted on the stock-record as is done when material is used.

Central District Confers

Work Toward Uniform Accounting

Chicago, Ill.—About 50 representatives of Class A, B, and C members companies of the United States Independent Telephone association in Wisconsin, Illinois, Indiana and Michigan, together with several state association executives, met at Chicago and stressed the importance of uniform accounting practice.

Effect of such uniformity in accounting, according to F. B. MacKinnon, president of the U. S. I. T. A., who presided at the meeting, would be to reveal weak spots in properties and to assist in the financing of smaller companies.

Wide variations in the figures presented by the companies represented were explained by a number of the leading Independent accounting authorities. Visiting accountants, in conference with these authorities, worked out some of their most perplexing problems. Particular attention was given the depreciation and maintenance expenses.

The general comparative summary of financial statistics for Class A, B and C Central District companies of the U. S. I. T. A. for the years 1916 to 1924, inclusive, follows:

	1916.	1922.	1923.	1924.	1916–1924. Increase.	1923–1924. Increase.
No. of central offices	336	368	373	361	25	†12
No. of telephones	201,976	279,436	299,729	306,263	104,287	6,534
Miles of toll wire	.....	.....	11,329	36,788	.....	25,459
Fixed capital	$18,450,369	$27,504,370	$29,290,623	$31,992,847	$13,542,478	$2,702,224
Total assets	19,754,057	30,763,752	33,083,729	37,308,310	17,554,253	4,224,581
Capital stock	10,400,639	13,866,343	15,304,336	16,716,752	6,316,113	1,412,416
Funded debt	5,139,046	6,669,220	6,192,599	7,816,937	2,677,891	1,624,338
Operating revenue	$ 4,005,868	$ 7,774,612	$ 8,417,767	$ 8,873,166	$ 4,867,298	$ 455,399
Depreciation	697,615	1,260,852	1,340,247	1,479,543	781,928	139,296
Current maintenance	594,302	1,337,992	1,329,098	1,393,029	798,727	63,931
Traffic	718,450	1,901,372	1,993,307	2,080,864	1,362,414	87,557
Commercial	172,424	402,299	451,339	496,567	324,143	45,228
General and miscellaneous	431,957	822,504	843,099	824,075	392,118	†19,024
Total operating expenses	*2,698,081	5,725,019	5,957,090	6,274,078	3,575,997	316,988
Net operating revenue	1,307,787	2,049,593	2,460,679	2,598,588	1,290,801	137,909
All other revenue	1,462	14,205	40,136	42,742	41,280	2,606
Taxes	$ 154,799	$ 473,626	$ 559,289	$ 637,098	$ 482,299	$ 77,809
Other deductions	77,577	143,850	194,163	231,475	153,898	37,312
Total deductions	232,376	617,476	753,452	868,573	636,197	115,121
Income available for interest and dividends	$ 1,076,873	$ 1,446,322	$ 1,747,363	$ 1,772,757	$ 695,884	$ 25,394
Interest	307,971	446,549	432,125	437,760	129,789	5,635
Available for dividends	768,902	999,773	1,315,238	1,334,997	566,095	19,759
Percentages:						
Income available for interest and dividends to fixed capital	5.8	5.3	6.0	5.5	Percentage of increase in No. of telephones:	
Net income to capital stock	7.4	7.2	8.6	8.0	1916–24—51.6	
Interest to funded debt	6.0	6.7	7.0	5.6	1922–23— 7.3	
Depreciation rate	3.8	4.6	4.6	4.6	1923–24— 2.2	
Operating ratio	67.4	73.6	70.8	70.7		

*This total larger than total of above accounts due to omissions in those accounts. †Decrease.

International Makes Substantial Progress in 1924

The annual report of the International Telephone and Telegraph Corp. for 1924 shows substantial progress of the company in the extension of its operations in various European and Central and South American countries. The outstanding feature of the year was the successful completion of its negotiations for the development of the telephone system of Spain through the agency of the Compania Telephonica Nacional de Espana. This subsidiary now controls and operates approximately 95 per cent of the long distance service and 85 per cent of all local telephones in Spain.

New financing during the year included the issue of 50,000,000 pesetas of the 7 per cent preferred stock of the Spanish company and $1,406,400 of the 7 per cent preferred stock of the Cuban Telephone Co., together with $9,000,000 par value of the common stock of the International Corp. The preferred stocks have been sold in the countries in which the operations are carried on, while the stock of the International Corporation is widely held in many countries. At the end of the year the Cuban system had a total of 53,393 stations and the Porto Rico Telephone Co. had 11,354 stations. The corporation is continuing the operation of its radio stations PWX and WKAQ, and is making studies of the possibilities of establishing radio service between certain points, but no installations are being made.

Net earnings from ordinary operations were $1,325,875, which is equivalent to 11.18 per cent on the capital stock of the corporation at the close of 1924. Dividends of 6 per cent were paid and the balance was carried to surplus.

Economy in Joint Pole Use

Safety and Economy Result from Joint Use of Poles. Rental Form of Agreement Between Power and Telephone Companies Is Found to Be Most Satisfactory Arrangement

By H. H. CARL*
Iowa Division Interference Engineer, Des Moines

I think the question most frequently asked when the subject of jointly using pole lines with electric power companies comes up is this: "What advantages are to be gained by the telephone company and power company from using each other's poles?"

To get the right answer to this question, it must be considered fairly from the standpoint of both utilities. If the joint use of poles worked largely to the advantage of one company, the other company would set its own poles, if possible. Therefore, the advantages to be considered must apply equally to both types of utility. There are two primary reasons for jointly using poles. These are as follows:

1. Safety.

Joint construction of local electric distribution lines and local telephone lines is safer, particularly in highly congested areas, than separate pole lines along the same street or alley. It has been our experience that where two such pole lines parallel each other along the same street or alley, the wires of both companies are on approximately the same level and service drops generally are in the same horizontal plane. Under these conditions it is hard to maintain proper clearance between the drops of the electric company and those of the telephone company. Under joint use, these service wires leave the same poles on different levels spaced to provide ample clearance, thus preventing accidental contacts which would result in service interruptions and possible property damage.

2. Economy.

With the growing capacity of poles and consequent increased costs, the economy to be effected by jointly using poles is constantly growing. In addition to the present saving in costs, there is also a saving for the future, as every pole-producing tree which is spared now will become a larger and stronger pole, available for use at some future date. Where the joint use of a pole line is practicable, the elimination of a second pole line also adds to civic appearance.

We are now ready, having decided that joint use is to the advantage of both utilities, to talk a little about the conditions under which joint use should be made. Everybody is agreed, I believe, that these conditions should be definitely determined and defined in advance of the creation of the actual joint use. The most logical way of establishing in advance the rights, conditions and obligations for the use of facilities belonging to others is by means of a contract. Thus, if one rents a house or apartment from another, he enters into a lease, which defines the rights and obligations of each party. This lease is in reality a contract.

In order that there may be no later dispute regarding the terms and conditions under which joint use is made we prefer to create this joint use under a contract which can leave no doubt as to the intent of the parties. This answers, I believe, what is usually the second question regarding joint use—"Why do we prefer to have all jointly used poles covered by a contract?"

How one pole does the work of two, carrying telephone wires, in cable, part way up the pole, and primary and secondary electric light wires at a safe distance above, at the top of the pole. Just above the telephone cable is a guard arm to protect it from linemen working above. To the right can be seen drop wires leading off from both the power lines and the telephone cable, demonstrating how joint use keeps drop wires to residences separated at a safe distance.

Courtesy Northwestern Bell.

All of our recent contracts with power companies are of the so-called "rental" type. This leads to what is generally the next question, "Wouldn't it be simpler for each utility to own an equal share in each pole, and have no rental payments passed between the various companies?" At first glance, this would seem the simpler method but experience has shown that it is not so.

Joint ownership of particular poles involves many problems. Separation for taxation, valuation for rate making, responsibility for replacement and repairs, damages, right-of-way and the ultimate disposition of the pole are some of the difficulties encountered under joint ownership.

On the other hand, joint use on a rental basis is simply the leasing of space by one utility to another. It is in all respects similar to one party leasing a part of a house to another.

While it is desirable that each utility should own fifty per cent of the jointly used poles, in practice this condition does not always exist and the owner of the larger number of poles is, therefore, entitled to earn a suitable return on the difference between his investment and that of the other company. This is taken care of by each company paying to the other a stipulated rental for each jointly used pole which he does not own. The rental must of course be equitable, and the best basis to use is a proportion of the annual charges on the cost of the poles in place. This is the basis we use.

"But there is more to the contract than a provision for rental, isn't there?" That is generally the next question. Of course there is! The rental provisions form only a small part of the terms of a contract.

You will recall that one of the advantages mentioned was "Safety." This safety cannot be secured without some definite standards of construction. The A. T. and T. Company's Specifications No. 4040, based on the national electrical safety code of the United States Bureau of Standards, has been developed as our standard of joint construction.

(Continued on page 41.)

The Unit Telephone Line

Subscriber Instrument, Location and Mounting—First of a Group of Articles, Discussing in a Systematic and Concise Way, Various Features of the Subscriber Line

By JOHN M. HEATH
1st Lieut., Signal Corps, U. S. Army

The larger telephone companies of the United States are all organized along the line of what is known as the "Functional System," consisting of three principal operating departments, viz.:

1. Commercial Department,
2. Plant Department,
3. Traffic Department,

each of these departments having a superintendent in charge reporting to the general manager of the company.

The order of precedence of the departments is as shown above. In other words, someone must write the business (Commercial Department) before there is any necessity for a telephone plant, then in turn someone must build the plant before there can be any traffic; finally the Traffic Department manufactures the service, and from the subscriber's point of view (and that is the angle from which all telephone problems should be considered) the Traffic Department is the most important of them all.

The Plant Superintendent

The plant superintendent, under the General Manager, is the official who is responsible for planning, building, and maintaining the plant. To asisst him in this the Plant Department is divided into four sub-departments as follows, each with a sub-department head:

(1) Engineering Department.
(2) Equipment Department.
(3) Construction Department.
(4) Maintenance Department.

It will be assumed that the plant under discussion is established, and that the several departments are in existence, thoroughly organized and functioning smoothly.

Synopsis of Telephone Plant

The purpose of this paper is to deal with telephone plant. By plant is meant the physical property, telephone wires and equipment on the subscribers' premises, on the outside, and in the Central Office, consisting of the following:

Plant on Subscriber's Premises—
(a) The telephone.
(b) The inside wiring.
(c) The protector.

Outside Plant—
(a) Drop wires.
(b) Poles and pole fixtures.
(c) Cable terminals.
(d) Aerial cables.
(e) Junction boxes.
(f) Conduit runs.
(g) Underground cable.

Central Office Equipment—
(a) Distributing frames.
(b) Relay mountings and relay racks.
(c) Fuse panels.
(d) Batteries.
(e) Switchboard.
(f) Power equipment.

Parts 1, 2 and 3 will be devoted to a discussion of the divisions of the plant as shown above.

The Unit Line

Figure 1 represents a telephone, outside line, and line circuit, extending from the subscriber's premises to the switchboard in the Central Office. It will be termed THE UNIT LINE.

Figure 1 is the unit of all telephone plants. It is one complete and working line from the subscriber's telephone to the switchboard in the central office. For our discussion we will begin at the subscriber's telephone and follow this unit line through its various ramifications and appurtenances to the switchboard. Later we will take up switching mechanism at the switchboard.

The principles involved in establishing, causing to work, and maintaining this unit line are the same in all exchanges regardless of whether the exchange serves ten or ten thousand lines.

If the reader will but take the time to study out and understand the unit line as explained in the following pages he will have no trouble in understanding the largest manual office in the realm of telephony, as the unit line will give all the principles necessary to one line, and an office of ten thousand lines is merely a multiplicity of the unit principle, all of the ten thousand being exactly alike.

Figure 1 is divided into three parts. Part 1 shows the plant on the subscriber's premises, part 2 shows the outside plant, and part 3 shows the central office equipment. These three parts will be analyzed in Parts 1, 2 and 3 of the text.

PART 1.

Plant on the Subscriber's Premises

1. *General.* The plant on the subscriber's premises consists of:

The telephone.
The inside wiring.
The protector.

Telephone services are classified under many headings by the different operating companies, some of the most frequent are:

1, 2 and 4 party unlimited service.
1, 2 and 4 party metered service.
1, 2 and 4 party coin-prepayment service.

The subscriber first comes in contact with the telephone company through its Commercial Department, usually when he places his order for the service by making a call at the companies' offices. At this time a contract is signed between the company and the prospective subscriber stating the kind of service he is to receive, stipulating

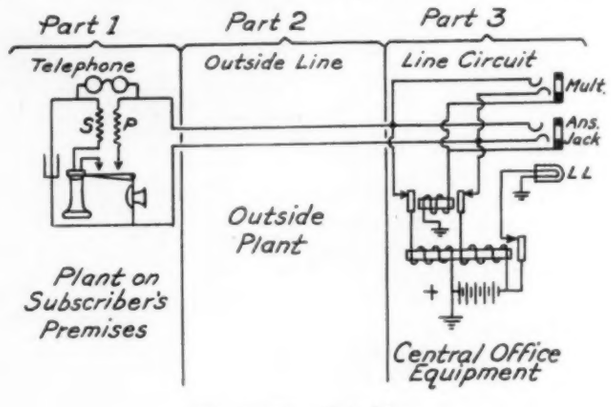


Fig. 1—The Unit Line.

rates, rentals, etc. The Commercial Department then causes the work order to be issued for the installation of the telephone. A copy of this order is sent to all the departments of the plant that will be concerned in its installation.

2. *The Telephone.* The first step that is apparent to the subscriber after he signs his contract for service is the delivery of the instrument at his premises, and next the coming of the workman to install it.

The telephone is the point from which the subscriber comes in most intimate contact with the telephone company and its service, hence it is the most important piece of plant from the subscriber's point of view.

Telephone instruments installed on subscribers' premises are of two types,

Fig. 2.—For one party stations, use two conductor inside wire.

namely: Desk and wall. Instruments used in present day practice are manufactured with metal covers, all terminals, and usually the bells are on the inside. When the instrument is closed the mechanism is neatly enclosed and protected from dust. This enclosure also eliminates fire and shock hazard. Another feature of having the bells on the inside of the case being that it eliminates the possibility of anything being laid on the bells and preventing them ringing, although having them suspended from the bottom of the instrument would serve the latter purpose as well.

When the workman calls to install the telephone, the first thing he does is to ascertain from the subscriber where the instrument is to be located. He will set the telephone in

Fig. 3.—For two and four-party stations, ringing to earth, use three, conductor inside wire.

the exact location desired by the subscriber, provided it does not conflict with any company rules. If the location desired by the subscriber conflicts with some rule of the company, such as being too near an electric light fixture or too close to a window, then it will be explained to the subscriber the reason for such rules, and another location agreed upon.

3. *Placing the Telephone Set.* Substation sets should not be located where they will become injured by doors or movable furniture, or close to registers or radiators, or where they will interfere with persons passing through the room.

Substation sets should not be mounted on damp walls or vibrating partitions. If a damp wall must be used, the telephone must be mounted on a board treated with waterproofing. A wall set should not be placed within two feet, nor a desk set within six feet of a window that is liable to be opened, provided it is possible to place the set in any other location. Noisy locations should be avoided as far as possible.

4. *Wall Sets.* Wall sets should be so located that the mouthpiece of the transmitter will be adapted to the height of the user. This height is about four feet ten inches from the floor to the center of the transmitter (when the face is vertical), unless otherwise desired by the subscriber.

A wall set should be firmly and securely fastened to the wall. If any projections interfere with the set being placed flush on the wall, the set should be blocked out from the wall with wooden blocks. These blocks should first be securely fastened to the wall with nails, screws, toggle or expansion bolts, and the wall set afterwards attached to the blocks with round-headed wood screws.

To fasten a wall set to a brick, cement, or stone wall, holes should first be drilled in the wall at the proper position for the screws. The holes should then be plugged with wooden plugs and the wall set fastened to the wooden plugs with round-headed wood screws. Care should be taken that thoroughly dry wood is used, and that the plugs are large enough to hold securely. As an alternative to the above, approved expansion bolts or screws may be used.

A wall set should be fastened to a hollow tile wall by drilling holes through the tile and then using toggle bolts.

5. *Desk Sets.* The desk set box of a desk telephone should be placed in a position readily accessible for repairs. When an installation is made on desks or other furniture, care should be taken not to injure the furniture by poor workmanship. The desk set box should not be located where it is liable to mechanical injury, and should be at such height above the floor as to prevent damage to it from chairs or other movable articles in the room. The desk set box and desk stand should be placed in such a manner as to prevent the cord from lying on the floor, or where it might be exposed to dampness.

The desk stand should be placed where it is convenient, and in so far as possible the location should conform to the wishes of the subscriber. The desk set box should be so located that the desk stand cord can be connected directly to the terminals of the box, otherwise an approved connecting block should be so placed that the desk stand cord can be connected to it and a triple conductor wire run from the desk set box to the connecting block.

When permanent wiring is placed on desks, sufficient slack should be provided to prevent the wires being broken, and connections pulled out, if the desk is slightly moved.

When a switching key is used with a desk set, the key should be mounted on the desk in such a position that the user can easily reach it from a sitting position.

When mounting the coin boxes on brick, stone, tile, or metal lath walls, a backboard should be securely fastened to the wall first, and the coin box mounted on the board.

George E. McFarland, Pacific Chief, Dies at San Francisco

San Francisco, Cal.—George E. McFarland, chairman of the executive committee of the Pacific Telephone & Telegraph Co. died in San Francisco on July 17, following an operation.

For more than 45 years Mr. McFarland was in the telephone industry, having made his professional debut at Marshalltown, Iowa, after preparation as a boy and college student, for a career in the telephone industry. He was a thorough master of his job, a tireless worker, and a team-mate and executive each of his fellow employees held in warmest esteem.

The earlier years of Mr. McFarland's business life were spent with Iowa telephone companies. In 1909 he went with the Northwestern Bell as vice-president and general manager, leaving that company in 1913 to become president of the Pacific.

Harry I. Dodson Made Chief Engineer, Northwestern Bell

Omaha, Neb.—Harry I. Dodson has been made chief engineer of the Northwestern Bell Telephone Co., following the resignation of R. A. Gantt to become chief engineer of the Southern California Telephone Co. Mr. Dodson has been identified with Bell companies for a number of years, having served with the Central Union and New York Telephone Co. prior to his connection with the Northwestern.

"Snow-Motor" to Buck Winter

New Fordson Unit for Winter Hauling

By GEORGE R. CULLEN

Detroit, Mich.—Great help for telephone companies in their winter construction and repair work is expected from the Fordson Snow-Motor, an ingenious device employing a Fordson power unit and having demonstrated its value in hauling heavy loads through deep snows.

The machine in its original form was invented by an Alaskan miner and his associates who sought a better method of transport than dog-teams. These men then built some of these machines, more or less crude, but practical, and used them to great advantage. As built by them the machine had bobsled steering equipment. The present machine does away with that arrangement, using drums for steering and the standard Fordson Tractor for motive power.

About ten years ago Col. H. H. Armstead, a mining engineer, purchased the patents of the Snow-Motor from the inventor, and built a number of these machines for his mining operations in the Pacific Northwest.

Snow-Motors were given a thorough demonstration in the deep snow country of northern Michigan during the winter of 1924-25. In some of the places where those trials took place the snow was so deep that it all but covered the pickets of high fences. There was no snow, or glassy ice, in that whole snow-bound region, which the Snow-Motors failed to negotiate. In these final tests a single Snow-Motor, Fordson driven, transported heavy sled loads of logs, that would have taken several spans of teams to haul, from a logging camp to a terminal, fifty miles distant, breaking the road through the snow all the way, so that teams, automobiles, and other conveyances could later follow them over the trail. The Snow-Motor, with a light passenger car for motive power, dashed over the snow, no matter what the depth, at a speed of 24 miles an hour.

Out of this expedition to northern Michigan was born a new corporation—Snow-Motors, Inc., a soundly financed organization which today is engaged in building the Fordson Snow-Motor at Detroit. This company is headed by A. F. Knoblock, as President and General Manager, one of the veterans of the automobile business, having furnished engine parts to Henry Ford when he was developing his first two-cylinder car; who was associated with the General Motors Corporation for many years as the executive head of the Northway Motor Company, and who, during the World War, was in charge of the production of tanks for the United States Army. The Vice-President is Col. H. H. Armstead. The Secretary-Treasurer is Harold H. Emmons, former president of the Detroit Board of Commerce, and prominently identified with the development of the famous Liberty motor during the World War. The directors and stockholders of

Snow-Motor Snow's Master

Note the spiral runners operated by the Fordson unit. It's the ability of these spirals to thrust against snow or ice that gives the Snow-Motor great pulling power, according to its makers

Snow-Motors, Inc., include William S. Knudsen, President of Chevrolet Motors; Howard E. Coffin, Vice-President of the Hudson Motor Car Co.; Hon. Robert L. Owen, United States Senator; Frank F. Beall, Vice-President of Gray Motor Car Co.; Frederick J. Haynes, President of Dodge Bros., Inc.; Hon. Edwin Denby, former Secretary of the Navy; Charles B. Bohn, President of Bohn Aluminum & Brass Corporation; A. T. Waterfall, Vice-President of Dodge Bros., Inc., and a number of other prominent automobile men.

The initial driving power of the Snow-Motor will be the standard Fordson Tractor. Stripped of this motive power the machine consists of two torpedo-shaped drums, to which flanges or spiral runners (sometimes called "skates") are welded. These drums, which are chain-driven, revolve in opposite directions, the spiral on one being right-handed and that on the other being left-handed. The torpedo-shaped ends of these drums and the spiral flanges engage positively with the snow or ice and, owing to the balanced thrust of one against the other, propel the Snow-Motor on a straight course, forward or reverse. Steering is effected by controlling the drive to one or the other of the drums. The action of the drums on the snow is virtually that of a worm and worm wheel, where the worm is formed by the spirals on the drum and the wheel by snow.

When the drums are running on ice the contact area is very small, as with skates. When they come to snow, they sink in, packing the snow down and, at the same time, increasing the bearing surface until it becomes sufficient to carry the weight of the machine. Further, as the weight bearing surface is increased, so also is the propelling surface of the flanges increased.

The machine has a wide track on each side, the tread being 58 inches between the centers of the drums, which are 30 inches in diameter. The whole power is behind the steering, giving it wonderful ability to maneuver. Owing to its very flexible construction it is easily managed, and it can be swung around in its own length. Any standard Fordson Tractor can be used on the Snow-Motor by removing the wheels and axle, which can be replaced when the tractor is needed again for its regular summer use.

Independent Vets Get Free Accident Policies

Indianapolis, Ind.—The Independent Pioneer Telephone Association has made arrangements with the Great American Casualty Company to insure all of its members whose dues are paid in advance. The members are furnished free, a liberal accident policy, giving the members protection for $1000.00 in case of loss of life, limb, eye sight, with an annual increase of $100.00 a year up to the fifth year.

J. K. Johnston, the veterans' secretary, states that to collect under this policy it is not necessary to fall from an elephant or get wrecked on the Siberian Railway.

The policy covers injury while driving your own automobile or getting knocked down or injured while crossing the street or highway. The company will also pay disability indemnity of $10.00 a week for 90 days covering certain accidents. The policy is broader and more liberal than most policies of the group insurance type and should be sufficiently alluring to every one who can qualify for membership, says Johnston.

LINE AND DESK

CREOSOTE TREATMENT ELIMINATES TERMITES

Reports of damage to telephone poles in more northerly regions, due to attacks of termites or white ants makes of timely interest the following information from "Wood Preserving News," which applies to poles as well as to buildings:

Recently the Bureau of Entomology, U. S. Department of Agriculture, has been advocating modifications of the building regulations of various cities in efforts to prevent attacks by flying ants—our native termites or white ants. Each spring these small ants emerge from the woodwork of buildings that have not been properly constructed. They have been able to enter these buildings because somewhere in the structures untreated wood is in contact with the ground.

No untreated wood should be laid on or in the earth. Where it is desired to place wood in direct contact with the earth, the wood should first be impregnated with coal tar creosote. Termites are not like the usual ants, which can be killed by insecticides or fumigation. They must be prevented from getting into buildings from the ground by means of their hidden burrows through untreated timber.

The Department of Agriculture has received several hundred requests for assistance in getting rid of termites. The fault in these cases is with the architect or contractor, and the owner should not be forced to pay for the damage done by termites. The safest insurance against attack by these ants is to insist that all wood coming in contact with the ground be thoroughly impregnated with coal tar creosote.

ROBIN CAUSES SEVERE INJURIES TO LINEMAN

Barney McGuigan, of the Rochester (N. Y.) Telephone Corp., recently ascended a stepped cable pole and was in the act of testing a pair of wires in cable box. A robin who had built her nest on the platform directly underneath the cable box apparently interpreted the presence of Barney to be for no good purpose. Without any preliminaries she flew directly at him, striking his face with her bill. Seeing the bird headed towards him for a second blow, McGuigan raised his hands, and in doing so lost his balance and fell to the ground—a distance of 15 feet, receiving fractures which will prevent a resumption of his duties for some time.

A number of other veteran linemen have had similar combats, and all agree that the robin has the tenacity of a bulldog. She will unhesitatingly attack man or beast when she feels that her home is in danger.

RIVER CROSSING CONSTRUCTION

An excellent set of river crossing fixtures erected by the Southern Bell Telephone & Telegraph Co. at Selma, Ala., is described by Harry Singler in a recent number of "Southern Telephone News." These fixtures provide the crossing for the Montgomery-Selma toll line, and were built by T. E. Locklin, construction foreman of the Alabama division, with his crew of eight men.

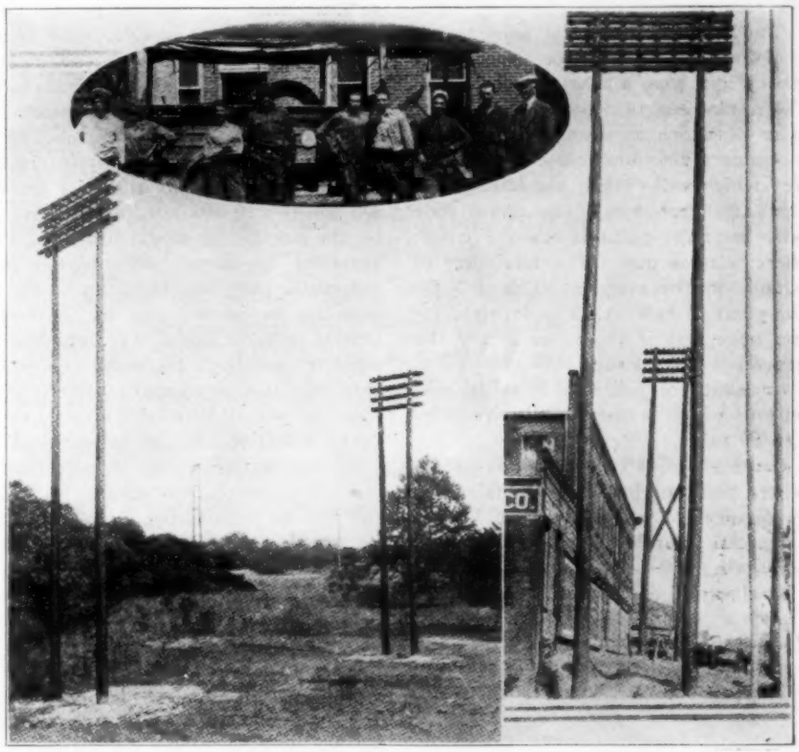
The fixtures on the Montgomery side of the river comprise an 85-foot hanger fixture and a 70-foot dead end fixture, while on the Selma side the fixtures are 95 feet and 75 feet, respectively, both fixtures being equipped with special suspension fixture crossarms 6x6, while the dead end fixture had special fixture crossarms 8x10.

The river span is 750 feet, while from dead end to dead end the distance measures 950 feet.

On the Selma side of the river the poles were set under the most difficult circumstances, they being set on the edge of the main highway to the bridge crossing, with traffic continually passing back and forth. In addition to the extensive traffic at this point, these poles were also raised close to a group of stores, necessitating the most careful planning and workmanship to keep from injuring persons or property.

After erecting the fixtures, Mr. Locklin strung 40 No. 8 steel wires in the river span.

Considering that he had but one man with as much as 18 months' experience, the job is a wonder.



"The Gang" and Their Nifty Crossing Job.

AN OPEN TEST WITH SLIDE WIRE BRIDGE.

The contributor who furnished the splendid article on the Slide Wire Bridge in our July "Line and Desk" now adds a useful feature in the following contribution:

The open tone-test is a very useful test, and to the trouble man who has much winter driving an accurate location on an open toll line is a boon, especially if the temperature is in the neighborhood of 35 degrees below zero.

For the open test, it is necessary to insert a receiver in place of the galvanometer (see diagram No. 1) also a No. 13 induction coil, if you have not a No. 13 induction coil, a Ford spark coil will do equally as well) a

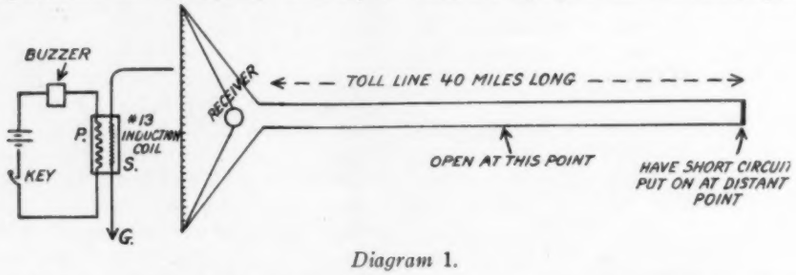


Diagram 1.

key and a buzzer, with sufficient batteries placed in the primary circuit to operate the buzzer.

It is best to place the buzzer at some distance away from the test desk or the noise of the buzzer will interfere with the test when the operator is getting close to the point where there is a minimum of sound in the receiver.

The proceedure for the open test is the same as the test for a grounded line: First, have a short circuit put on the distant end of a pair of wires, one wire of which is open. After bridge is connected to line, close the battery key which will operate the buzzer. At the same time, tap needle along slide wire until the point is reached where there is no sound (or a minimum of sound) in the receiver. This will be the point of balance. The formula for the open test is the same as for the grounded test. Example:

a=length of toll line 40 miles, one wire of which is open, total wire mileage 80 miles.

b=number of divisions on scale where point of balance is obtained is 24 divisions.

c=total number of divisions on scale, viz.: 100.

x=distance to trouble.

$$\frac{a \times b}{c} = x. \text{ or } \frac{80 \times 24}{100}$$

$$\begin{array}{r} 24 \\ 80 \\ \hline \end{array}$$

100)1920(19.1/5 miles to trouble.

Diagram No. 1.

By using a little ingenuity, the pieces necessary for these measurements can be mounted neatly as close as possible to the slide wire and by the use of a few keys it can be arranged so that the switch over from one test to another can be quickly made by just pressing over a key.—Contributed.

A POWER LINE AND TELEPHONE PROBLEM

The following query comes to us from a rural line company: "The power company has built a line from C. to S. and now wants to build to H., but they want to get the telephone lines onto one side of the road and also are trying to come to some agreement to eliminate the trouble created on the line by the power lines. They first offered to furnish one No. 14 steel wire from H. out along their line for six miles and move the poles, but wanted the telephone company to take care of the laterals. Later, they agreed to furnish any number or kind of wire.

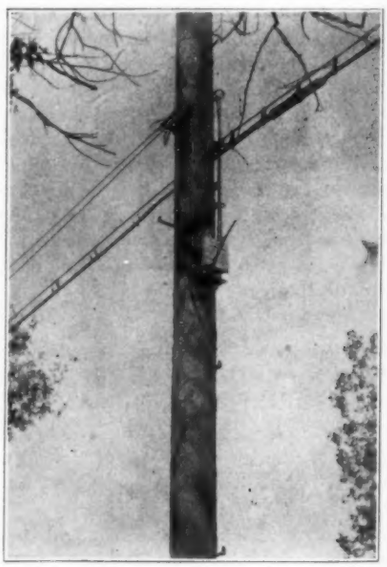
"One man on the telephone line said they ought to use No. 9 BB wire and 6-pin cross arms. The telephone line has 40 poles to the mile, one-half about eight years old and the others about 20 years old. There are three grounded lines now on 4-pin crossarms, which are quite rotten, I think. Do you think cross arms are necessary on the laterals, or would brackets do? Some of the members think that the power company should put up a whole new line before we give up to them. Others thought that if we could figure what it cost us to build the new line, then take half and ask the power company to pay it, it would be a square deal. What would you recommend?"

In the matter of line construction, our recommendation would be that the line be rebuilt, using as much of the present material as possible, putting on 6-pin arms where three circuits are needed and making the branch lines metallic, using brackets if only one circuit is required. No. 12 BB iron wire is pretty generally accepted as the standard for this type of line. There seems to be no reason for No. 9 wire, either on account of strength requirements or to obtain a lower resistance. Some of the hardware from the 4-pin arms migbt he used, but if plain hardware were used in the beginning, it will be difficult to remove it in condition for re-use. New hardware should be galvanized. In the rebuilding of the line, particular attention should be paid to guying the corners, pulling slack and trimming trees. All joints should be made very carefully, preferably using double-tube sleeve joints on the new iron wire and soldering all joints between the iron wire and copper inside wires.

We are scarcely in position to make recommendations as to the form of agreement to be entered into with the power company. Apparently, the power company is inclined to be reasonable in the matter or they would not have offered to bear part of the cost. If they are met with a reasonable offer in return, it is likely that an agreement can be reached. Two extremes are: that the power company build a new telephone line at its own expense, and that the power company pay none of the expense. Probably neither of these would be fair in the circumstances, but there is certainly some middle ground upon which you can meet the power people. Why not propose that they bear half the cost as suggested by some of your members? Perhaps this will seem fair to them and they will agree.—Staff Contribution.

READY TO CUT IN

The photograph of this neat job of cable and twisted pair drop construc-



tion was sent in by Ray Blain, a frequent contributor to this column.

Corning, Kan.—W. H. Wessell has bought the Corning Telephone Co.

Within the means of all

Visitors from foreign countries invariably wonder at the number of telephones in America. "Why is it," they ask, "that nearly everybody in America has a telephone, while in Europe telephone service is found only in a limited number of offices and homes?"

First of all, telephone rates in the United States are the lowest in the world for the service given. Here, since the beginning, the best service for the greatest number of people has been the ideal. By constant improvement in efficiency and economy the Bell System has brought telephone service within the means of all. From the start, its rate policy has been to ask only enough to pay fair wages and a fair return on investment.

The American people are eager to adopt whatever is useful. They have found that Bell telephone service, comprehensive, prompt and reliable, connecting them with the people they wish to reach, is worth far more to them than the price charged for it.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES
BELL SYSTEM
One Policy, One System, Universal Service

U. S. Leads Telephone World

Statistics published by the American Telephone & Telegraph Co. show that there are nearly twice as many telephones in the United States as in all the rest of the world put together. Out of a total of 24,576,121 telephones in use throughout the world, January 1, 1924, there were 15,369,454, or 63 per cent, in the United States of America. Europe had 6,390,765 telephones on that date, or 26 per cent of the world's total. The remaining 2,815,902 telephones, comprising 11 per cent of the whole, were scattered throughout Asia, Africa, Oceania and the Western Hemisphere outside of the United States.

While we had in this country one telephone for every seven people, in all other countries combined there was but one telephone for every 185 inhabitants. The telephone systems of the world showed a net growth of 1,517,291 telephones during 1923. Of these, 873,601, or well over half, were added to the telephone systems of the United States.

The work of collecting authoritative data from every quarter of the globe has taken considerable time, and the published statistics therefore reflect conditions as of January 1, 1924. On that date there were 13.7 telephones for every 100 population in the United States, as compared with 3.8 in Germany, 2.5 in Great Britain, 1.5 in France and 0.4 in Italy. The countries approaching nearest to the American record in this respect were Canada, with 11.0 telephones per 100 people, and Denmark, with 8.7. These figures take on added significance when it is recalled that most of the telephones, both in Canada and in Denmark, are owned and operated by private enterprise, as in the United States, while the relatively undeveloped telephone systems of Germany, Great Britain and France are under government ownership. The Japanese telephone service, which is also a government monopoly, showed a development of only 0.8 telephones per 100 population. Many thousands of telephones were destroyed in the earthquake of September, 1923, but even prior to that disaster Japan never attained a development of as much as one telephone for every 100 people.

This survey also shows that Americans use the telephone much oftener than Europeans. In 1923 the average American had 184.5 conversations by telephone, while the average German had 31.1, the Frenchman 20.8, the Englishman 20.4 and the Italian 9.0. In this respect the Scandinavians made a much better showing than other Europeans, with 123.7 telephone conversations per capita during 1923 in Denmark, 109.6 in Norway and 95.8 in Sweden, but even these figures are far behind the record of 184.5 for the United States.

Telephone development abroad is largely concentrated in the more important cities. London and Paris, for instance, each have over one-third of all the telephones in their respective countries. In comparison with American cities, however, they make a poor showing. On January 1, 1924, London had 5.4 telephones for every 100 people, Paris 7.0 and Berlin 9.8. Stockholm was the only European capital which had attained a telephone development comparable to that of several American cities. Even Stockholm's record of 24.6 telephones per 100 people was surpassed by such cities as San Francisco with 28.8 telephones for every 100 inhabitants, Omaha with 28.3 and Minneapolis with 24.8. New York City alone, with 1,186,573 telephones on January 1, 1924, had more telephones than the whole of Great Britain—more, in fact, than any foreign country except Germany. Yet a comparison of the number of tele-

In the early days, the development of telephone, switchboard and cable protection was slow until the Reliable Electric Company developed and perfected the Sawtooth Discharge Arresters, now used by two-thirds of the operating telephone companies.

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phones per 100 people in large and small communities shows that in the United States the telephone facilities of the smaller cities and rural districts are much better developed than they are in any European country. Farmers' telephone lines are extremely scarce outside of North America.

Cable Across Galveston Bay Tough Job for Southwestern

Galveston, Tex.—Laying a submarine cable across Galveston bay proved to be one of the real tough jobs the Southwestern Bell Telephone company men recently have handled with success. Unusual difficulties were met and overcome in the laying of this cable, which is two and a half miles long, four and a half inches in diameter, and contains 54 pairs of 16-gage, double insulated wires. The cable was delivered in four reels, each reel weighing from 17 to 18 tons.

The first problem arose from the fact that the bay is shallow, never more than 16 to 18 feet in depth, and it was impossible to use a regular cable-laying boat. The shallow draft barge Lucy had to be used and towed along the trench while the cable was unreeled. A special steam barge, the Ajax, was secured to hoist the heavy reels onto the barge.

The next delay came when the Lucy sank June 9 during a squall on the bay. She had to be towed to shallow water and raised, and another barge was secured to replace her. Splicing of the cable was done under the supervision of F. J. Owsley, splicing foreman of the southeast Texas division. Extra precautions were taken against interruption of service from low insulation or leakage and damage, from ships' anchors.

The regulation splice was made, then a second lead sleeve was placed over the regular splicing sleeve, and the space between the two was filled with insulating compound. Finally the steel wires which protect the sheath of the cable and which had been pulled back to permit splicing were rewound over the sleeves, leaving the splices as strong as the remainder of the cable.

The cable towers at each side of the bay were completed early in July and the work remaining to be done—boring underneath railroad lines at Virginia Point to lay a conduit to carry the wires from the cable to the lines on the mainland—was completed before the end of the month.

TELEPHONE ENGINEER
Advertising Is Read by
The Man Who Is Buying

Texas Plans District Meet for Tyler, August 19-20

Tyler, Tex.—A district meeting and traffic conference of the Texas Independent Telephone Association will be held here at the Blackstone Hotel, August 19 and 20.

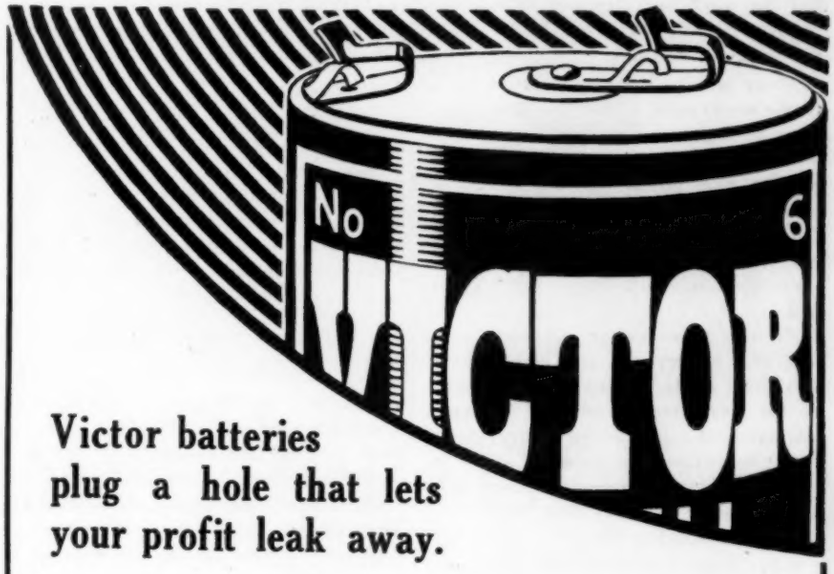
The first day will be devoted to talks and addresses on various phases of the telephone business, aside from traffic. The entire second day will be given over to the traffic conference at which it is expected a large number will be present. The indications are that the operators and chief operators who will attend this meeting will exceed the number that has attended any other traffic conference of the association.

Special arrangements are being made by President Still to entertain the visiting telephone people.

Among those who have already signified their willingness to take part in the program are:

George McQuaid, director Texas Public Service Information Bureau, Dallas, whose subject is "Public Opinion."

L. S. Gardner, secretary of the association of Waco, who will make a talk on the subject of telephone accounting.



Victor batteries plug a hole that lets your profit leak away.

Experts have estimated that 6% of the average magneto telephone income is dry battery expense.

Use of Victor batteries makes a sharp reduction in this cost. There are plenty of cases where Victor cells have given good telephone service for two years, and then been replaced only because the manager was getting nervous from this uncanny long battery life.

It's not just luck that is responsible for Victor longer life. This battery is the masterpiece of the brilliant career of the dean of the dry battery profession.

It has the thickest zinc shell; densest compound; special paste and liners to prevent action within the shell and other sound construction reasons for giving longer, livelier life.

Ask us for the name of the nearest Victor distributor and allow him to show you WHY the Victor battery saves for you.

THE CARBON PRODUCTS CO.
LANCASTER, OHIO

What Is Supervisor's Job?

Interwoven Details of Telephone Business Put Premium on Supervisor Who Is Onto Her Job—Standardizing Practice

By ADA DURFEE*

One of the chief needs of traffic supervision is to establish uniformity of practice throughout our telephone system; to give to the smaller offices as well as to the larger ones the benefit of training in approved operating practices. The telephone industry is so closely interwoven that it is essential that each operator and each office cooperate with the other to facilitate the handling of traffic.

There are two distinct duties of a traffic supervisor. The first is to produce prompt, accurate and courteous service—service that satisfies and pleases the public—at a reasonable cost; and the second is to see to it that the employes giving this service are not only doing a good job, but that they are contented, happy and satisfied.

Persons in executive positions such as traffic supervisors and chief operators must study human nature as well as the problems of efficient business management. Successful supervision is not to enforce the rules as much as to obtain their observance. People will usually observe rules but object to someone enforcing them.

Some chief operators and operators are always skeptical about any change in the traffic rules or routine of their offices, and this is the one situation where the traffic supervisor, by use of tact and diplomacy, must keep down any friction that might arise. Believing sincerely in your company and having the respect and confidence of your operators, will help overcome any difficult situation.

Picking Force Big Item

In most of our comparisons, I think, the traffic supervisor deals directly with the chief operator at each office. She should, therefore, use great care and judgment in choosing and training her chief operators. To have the happiest and most efficient operators it is necessary that the chief operator be alert, interested, firm and businesslike, because these qualities create harmony, and harmony promotes efficiency.

The right kind of a chief operator has all kinds of opportunities to win her operators' confidence, and to keep them satisfied and to thereby improve the service. It is one of the traffic supervisors' responsibilities to see that each office has the right kind of a chief operator and to assist her in every way possible. A traffic supervisor is in a position to pass on any information or help that may come to her from some other office. Perhaps something that is being done in one office can be put into effect in some other office where it will prove beneficial.

A traveling chief operator can usually detect and correct practices and habits which a chief operator has overlooked. She can also observe the general appearance of the office. Perhaps it is not any too neat, dust has collected here and there, unnoticed by the chief operator, etc.

Pass on Conference Tips

We have all heard papers read and discussions on "Accurate Timing and Recording of Toll Tickets," "Routings," "Overlap Ringing," "Courtesy and Cooperation" and other subjects until it would seem that we should all be familiar with their importance. Perhaps we are, but are we passing it on so that every operator in each exchange may become just as familiar with them as we?

We all,, no doubt, leave a conference full of enthusiasm and with all intention of doing a better job when we return to our respective offices and companies. The chief operator or operator present will tell the rest of the force just what took place and about the different discussions—and that is all there will be to it. In a few weeks or months, the conference is forgotten, and every one is back into the old routine.

This would not be the case if there is proper supervision. Keep the operators interested in their work by carefully following up every phase of operating. Never let them forget the importance of their work. Frequent visits to the offices, local conferences and get-togethers during the year, re-drilling of local and toll operators and constant observance of all rules, are necessary to give satisfactory service. A traffic supervisor cannot visit an office and put new routine and rules into effect, and then not visit it again for several weeks and expect results. To obtain results in any work, one has to keep everlastingly at it.

And now comes the problem of keeping the girls satisfied and contented. The average girl wants to do the right thing and if she is given the encouragement will do it well. In the first place, one has to like their work before she can do justice to it. We have heard about trying to please the subscriber, about the things he dislikes about the service, but somehow we never stop to consider the things the operators might not like about their work.

It may be the undesirable hours, the ventilation, an operating chair has become unsteady and uncomfortable, restroom is unsatisfactory, or numerous other seemingly small things, but nevertheless they are the very things which are constantly working against the good will of the operator. In most cases it is some trivial matter that makes an operator dissatisfied with her work. Countless little suggestions and needs in each office could be provided to make the work more attractive and satisfactory to the girl at the switchboard.

Then, too, there may be girls in your force who are never in the frame of mind to be satisfied with any thing that is being done for them. Talk things over with them and let them know that you want to do everything possible for them, but that it is a 50-50 proposition and that you need their help and cooperation. If they are sincere about their work, they will usually respond; if not, it is a good thing to find out before they have done too much damage to the standard set.

As traffic supervisors, it is up to us to make telephone work so attractive that our girls won't leave us for any reason that we can possibly prevent. Our work is not alone to teach the fundamentals of operating, but to keep the operator contented and happy; in other words, to keep up the morale of the office. In doing so it really reflects on the service rendered.

**Paper at Up-State New York traffic conference.*

Buys Company at Lathrop (Mo.) as System Nucleus

Lathrop, Mo.—P. T. Cross, acting for a group of business men who plan to incorporate the North Missouri Telephone company, has bought the Clover Leaf Telephone company, operating approximately 600 telephones at Lathrop and Hopkins, Mo.

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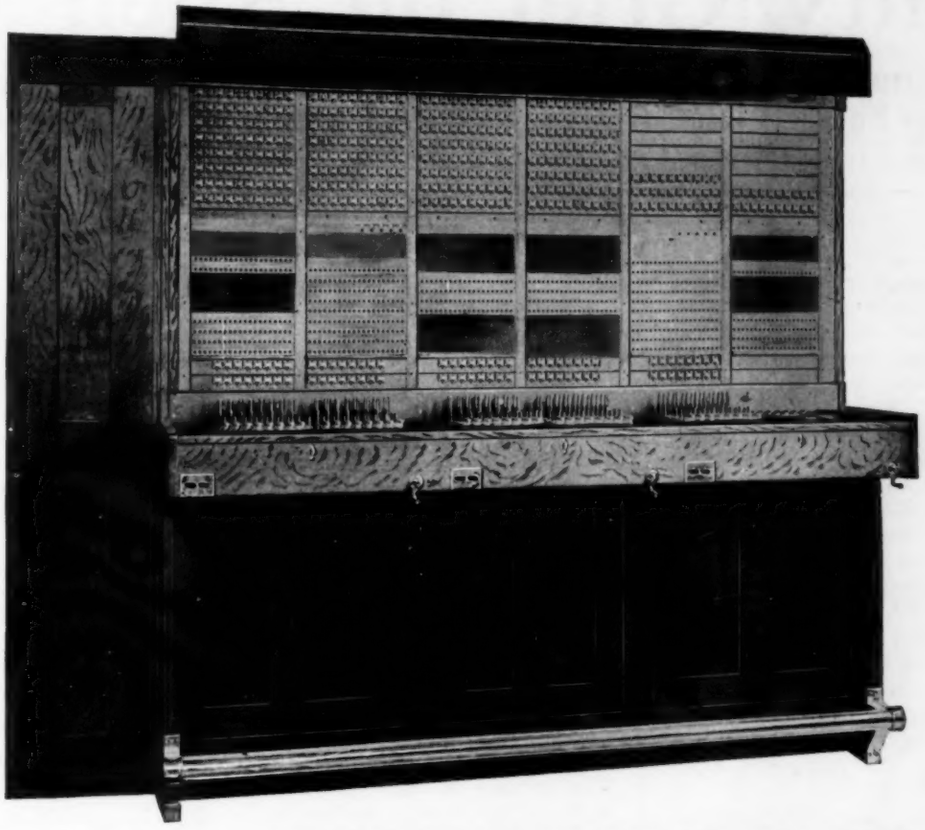
Advertising in
TELEPHONE ENGINEER
Reaches the Man Whose Word Is Buying Law



CALL DISTRIBUTION

The Secret of Speedy Switchboard Operation

The problem of increasing operating speed is solved in any type of manual or semi-manual switchboard by an efficient means of distributing the calls so an idle operator can answer immediately. The less idle time each operator has, the more efficient is her work and the more value she is to the company.

If the calls are distributed on a switchboard in such a way that all operators are working efficiently, the specific method of doing the work does not enter into the consideration except as to the cost of the equipment. An equipment that costs double to do the same work obviously will not be as good an investment as the less expensive equipment.

Leich Magneto Multiple Switchboards provide a most efficient method of distributing the incoming calls and yet the first cost is much less than switchboards with the more complicated circuits.

From the investment as well as the operating standpoint the Leich Magneto Multiple Switchboards will serve both economically and satisfactorily.

Operating companies wishing to obtain the greatest value in switchboards for their money are invited to write for facts about the Leich Magneto Multiple Switchboard.

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Plenty Grief on Alien Jobs

Line Construction in Foreign Lands Brings Boss Face to Face With Strange Troubles—"Holy Tree" Picked on Line Brings Trouble—Nothing Stops the Line Gang

By R. S. Coe
(*American Telephone and Telegraph Company*)

About a gigantic plane tree in the Balkans was gathered a threatening crowd of Albanians and Serbs. A line gang had already begun trimming the tree to make way for an aerial cable. The huge trunk, sixty feet in diameter, was unthreatened, to be sure. But already one ponderous limb had been sawed off and the tree trimmers were preparing to cut another branch.

The community, Christian and Mohammedan alike, had rallied to the defense of the holy plane tree. Venerated for generations, it had gathered about it a mass of hoary tradition running back to the days when it was worshipped under the Serbian Nemanyich dynasty in the middle ages. Even the gendarmes were in sympathy with the demonstration. In the crowd their police uniforms were conspicuous among the short jackets of the white-kilted Albanians and the scarlet and blue waistcoats of the Serbs.

The protests were becoming momentarily more vehement. At this point, however, the local authorities took a hand. Quieting the crowd as best they could, they presented a solemn official protest against any further desecration of the sacred tree.

This incident illustrates one of the difficulties sometimes encountered in telephone and telegraph line construction in remote countries—native hostility. Even among the turbulent mountainers of southeastern Europe, however, hostility can generally be overcome by tact and good sense. Indeed, it is often easier to deal with open opposition than with the less tangible obstacle of native shiftlessness and indifference. This became very evident to the engineers who constructed a telephone system a few years ago in one of the South Sea Islands.

South Sea Island fiction of the alluring type generally has little to say about three things. One is the rainy season. Another is the insects. And the third is the exasperating indolence of the natives.

In this case, for example, when jobs were offered on the telephone construction gang, the easy-going islanders simply were not interested. Work seems superfluous in a land where requirements for clothing, fuel and shelter are reduced to a minimum and where food is abundant and easily obtainable. A few of the natives, infected —very slightly—with the germ of ambition, work now and then in the cocoanut plantations. But the tendency is to quit as soon as a little money has been earned.

Design "Barefoot" Spade

In the end, the labor problem which confronted the telephone engineers was solved only by the assistance of the local government. Since a native construction gang could not be recruited to put through the work voluntarily, it became necessary to find natives who could be compelled to do so. This was accomplished by getting the government to put a gang of indolent native convicts on the job. Even then, however, new difficulties presented themselves. The regulation spades for digging pole holes could not be used by the barefooted islanders. A type of spade especially adapted to their requirements had to be provided.

For a laudable "hard-boiled" stubbornness in getting his job done in spite of formidable difficulties the lineman at last is achieving recognition internationally. This article, appearing in some of the Bell company journals, tells of the diversity of misery tackled by the linemen of many lands.

On these low-lying coral islands the holes in which the poles were to be set tended to fill with water as soon as dug. Many of the telephone poles, therefore, not only had to be thoroughly tarred to prevent decay, but required special supports as well. It was necessary to bring the poles themselves all the way from New Zealand, as the trees growing on the islands—mostly cocoanut palms — were not strong enough to support telephone wires. Poles, tools and other supplies had to be moved about on hand-carts, as there was no other way of getting them from place to place. All these handicaps were ultimately overcome, however, and the telephone system was installed despite the difficulties of construction. If one were to search the world over, he could hardly find a more striking contrast than that between the coral isles of the South Seas and another island in which also telephone construction has been carried out in the face of difficulties. Many thousands of miles from the sparkling waters of the South Pacific there lies a bleak land against whose cliffs the cold gray waves of the Atlantic beat unceasingly. Deep fjords indent its shores, and in winter Arctic gales sweep over the uplands and along the coast with merciless severity. Such is Iceland. Yet it is the home of a progressive and hardy population who, since the days of the sagas, have made their island a worthy outpost of Scandinavian civilization. The capital, Reykjavik, is a modern city with paved streets, a medical school, libraries—and telephones.

Telephone and telegraph construction in Iceland has been no easy task. In winter the wires sometimes become encased in cylinders of ice six inches in diameter. Poles twenty-three feet high have been completely covered by drifting snow. Where the lines cross the fjords in submarine cables they are often in danger of breakage by floating ice.

Tough little ponies are the chief means of transportation outside the towns. The Icelandic linemen, riding out in winter across the frozen drifts, sometimes fording icy streams or urging their ponies along the precipitous sides of the fjords, face handicaps that have been overcome only by the utmost hardihood and resolution.

Nomads Have Phone Aid

In northern Sweden, also, the telephone is pushing on, even into the Arctic Circle. Not long ago the Swedish telephone authorities undertook to extend their wires far up toward the northern end of the Scandinavian peninsula, in the region known as Lapland. This telephone line is to be used for the transmission of "meteorological bulletins and information of snow conditions" to the wandering tribes of Lapps. These hardy nomads depend for a living upon the herds of half-wild

A Few Facts About Twisted Pair

Paint manufacturers have demonstrated that it costs more to paint a dwelling with cheap paint than it does with a quality product. The cost of applying the paint is the big item.

The same rule applies to drop wire.

As for paint, the labor charge is greater than the cost of the wire. The difference in price between quality wire and cheap wire is slight—but, what a difference in the length of service.

When you purchase a quality wire you are assured of long life, low annual cost, a reduction of maintenance charges and continuous service to your subscribers.

To produce an insulated wire which will have these characteristics requires an insight into the conditions of service.

It takes more than wire, rubber and cotton to make a quality drop wire.

Copperweld drop wire was designed by a telephone engineer of twenty years' experience in the field.

No. 17 Copperweld wire and its insulation are manufactured by companies who have specialized for years on telephone wire and, today, are the largest producers in the world of this type of product.

There are three features that make genuine Copperweld Drop Wire the standard of quality—Experience, Good Material and Careful Workmanship.

The conductor is genuine Copperweld wire made by the Molten Welding Process.

The rubber insulation is compounded with the greatest of care and the very best of materials.

The braid is of strong long fibre cotton yarn—closely woven. The saturating and finishing waxes are the so-called A. T. & T. standard—high-melting point and durable. The twisting of the pair is just right to give a uniform strain on both wires and maintain a uniform twist throughout its life.

The testing is thorough and only coils which meet all of the specification requirements are shipped.

The result of all this care is a standard of quality product, guaranteed by the Copperweld Steel Company and the Electric Cable Company.

No other drop wire has such a guarantee.

Quality is the reason.

Service is the answer.

Insist on genuine Copperweld.

Genuine

"COPPERWELD"

TRADE MARK REG. U.S. PAT. OFF.

TWISTED PAIRS

QUALITY—SERVICE

KELLOGG SWITCHBOARD & SUPPLY COMPANY

CHICAGO, ILL.

Columbus Kansas City
San Francisco Portland

DISTRIBUTED FROM STOCK BY

Monarch Telephone Mfg. Co.

1027 WEST VAN BUREN ST., CHICAGO, ILL.

Copperweld Steel Company

FORMERLY KNOWN COPPER CLAD STEEL COMPANY

MAIN OFFICE & MILLS - BRADDOCK P.O., RANKIN, PA.
30 CHURCH ST., NEW YORK. 129 S. JEFFERSON ST., CHICAGO
403 RIALTO BLDG., SAN FRANCISCO

There is no other "copper-covered steel" or "copper-clad steel" made like "COPPERWELD"—by the Molten Welding Process.
Have you received full information on Copperweld wire?

DO NOT ACCEPT SUBSTITUTES—TAGS ON THE GENUINE CARRY THIS TRADE-MARK— "COPPERWELD"

reindeer which supply them with milk, meat and skins. They drive the reindeer south in the autumn, returning north again when winter has broken.

The mountainous wilds of Thibet in the depths of central Asia have also been penetrated by a wire line, and the ubiquitous telephone has finally reached even the Forbidden City of Lhasa. For a hundred and forty-four miles this line was pushed forward with incredible labor over the roughest kind of country. The unskilled work was done by Thibetan peasants, who took the place of the yaks as beasts of burden on trails where even these great ox-like creatures found the going too hard. Over the desolate heights, along roads that were merely the roughest of tracks, these stalwart Asiatic villagers hauled the poles, a family of six often forming the team for a single pole.

The construction work was done by engineers of the India telegraph service loaned for the purpose to the Thibetan government. As the project was undertaken at the behest of the Thibetan authorities, there was little opposition on the part of the natives. A few of the more timorous, however, protested at the construction of the line across their fields, fearing that they might be held responsible and punished in case of accidental injury to the poles or wires.

In various quarters of the globe telephone service has been established in the face of formidable obstacles to meet a temporary, or at any rate a highly specialized, need. Of this character was the telephone line pushed out across the sands of Egypt to the tomb of Tut-ankh-Amen.

Under the broiling sun of Africa a platoon of Egyptians struggled up a precipitous hill. Scrambling, straining, pushing, heaving and hauling in the stifling heat, they finally reached the summit, dragging with them the pole-line equipment for the construction of this desert telephone circuit. The Valley of Kings, where lies the famous burial vault, is shut in by a steep hill. This, as well as the treacherous Nile, had to be spanned by the telephone line from the tomb of Luxor. This line was the first telephone circuit on the west bank of the Nile in this part of Egypt. It was not built for public use, however, but was designed solely to keep the explorers at the tomb in constant communication with Luxor, and thus speed to the outside world news of the successive discoveries in the magnificent sepulcher of the Egyptian king.

The blistering heat of Egypt, in which this telephone construction was carried out, is at least a dry heat. Elsewhere, gangs hew through jungles.

RECONSTRUCTED EQUIPMENT

Monarch 3-bar 1000 or 1600 ohm Bdg. compacts @ $7.00—4-bar @ $7.50—5-bar @	$ 9.00
Western Elec. Co., No. 26987 Switchhooks for No. 1317 compacts @	.45
Western Elec. No. 13 Local battery Ind. Coils @	.35
Western Elec. Square base Transmitter arms @	.25
Western Elec. 2 or 3-bar Bdg. hand Generators complete with cranks @	1.50
Western Elec. 2500 ohm Biased ringers complete with gongs @	1.35
Kellogg No. 28 3-bar 1000 or 1600 ohm Bdg. desk sets @ $10.00—4 bar $11.50—5-bar @	12.00
Stromberg No. 992 type 3-bar 1000 or 1600 ohm Bdg. desk sets @ $10.00—4-bar $10.50—5-bar @	11.00
Kellogg No. 10½ M. F. Condensers @	.35
Garford 1 M. F. Condensers @	.35
New Western Elec. Mouthpieces 7c ea. Lot of 50, 6½c ea. Lot 100	6.25
New Western Elec. No. 143 W. Receiver shells with caps, 37c ea. Lots of 50, 36½c ea. Lots of 100 @	35.00
Kellogg Local or Common battery Transmitters complete with new mouthpiece and backs @	1.00
Kellogg No. 17A Receivers complete with cord @	1.00
Monarch, American Elec. or Andrae local battery Ind. coils @	.30
Stromberg Carlson late type 5-bar Bdg. hand Generators complete @	2.25
Am. Elec. Century, Andrae or Federal Tel. 4-bar Bdg. hand Gen. complete with cranks @ $1.00—5-bar @	1.25

Write for Our New Bargain Bulletin Just Off the Press.

REBUILT ELECTRIC EQUIPMENT COMPANY. Not Inc.
E. C. Stoeffhaas, Mgr.
1940 W. 21st Street, CHICAGO, ILL.
We are not connected with or successors to Rebuilt Telephone Equipment Co.

$37.50

Addressograph

CHEAPER than typewriter—**SAVES** 30% of **YOUR** present costs — 5 to 15 times **FASTER** and **BETTER** than pen or typewriter.

FREE TRIAL will prove it!

904 W. Van Buren St., Chicago, Ill.

WANTED TO BUY

One blank section, number 10 Western Electric Switchboard. Address Norfolk and Carolina Telephone and Telegraph Co., Elizabeth City, N. C.

WANTED

First-class cable splicer on maintenance and trouble work, principally. Permanent position to satisfactory man. Company now employs two regular cable men but desires additional man. Address, giving experience and references: Petroleum Telephone Co., Oil City, Pa.

POSITION WANTED:

By middle aged, all 'round telephone man, eighteen years' experience in construction, maintenance and trouble, not afraid of work. Married. Open for position October 1. Central states preferred. Can prove ability. Address Experience, 4734 Emmerson Ave., No. Minneapolis, Minn.

FOR SALE—By owner, telephone system of about 250 telephones; 185 miles wire. Operating revenue, $665.00 per month. Operator's wages $135.00 per month; I do the rest of the work. Address Henry Christensen, Eatonville, Wash.

On the rain-soaked tropical island of Borneo, lying only a few degrees north of the equator, is a seven-mile telephone cable connecting the oil fields with the coast. These oil fields are at Lutong in the Raj (or principality) of Sarawak. From this remote spot communication was established by telephone with the port of Miri—something of a feat considering the climatic conditions.

Sarawak has had a picturesque history. About 85 years ago the people rose in rebellion against the native Rajah who ruled the land. The rebellion was suppressed by an English officer, who thereafter himself ascended the throne and became Rajah of Sarawak in place of the native prince. The office of Rajah is hereditary and from that day to this it has been held by scions of the English family whose forbear assumed the throne in 1840.

These examples illustrate some of the special requirements which have carried the telephone into remote and picturesque quarters of the Globe. In Lapland the telephone is an aid to reindeer herding. At the tomb of Tut-ankh-Amen it serves the needs of archaeology. In Sarawak it facilitates the business of oil production.

Although in certain cases the introduction of the telephone has been due to the needs of some particular undertaking, there is in many lands a growing appreciation of the value of telephone facilities for the general public. In various countries men are striving for the building up of telephone service along lines similar to those which have been followed in the United States.

August Busy Month for Meets In Minnesota

St. Paul, Minn.—An interesting series of programs has been arranged by Secretary J. C. Crowley, Jr., of the Minnesota Telephone Association for the district conferences to be held in the northern part of the state during August. The district conference schedule follows:

Virginia, Minn., Tuesday, August 18.

Pine River, Minn., Thursday, August 20.

Sauk Center, Minn., Friday, August 21.

Thief River Falls, Minn., Tuesday, August 25.

Fergus Falls, Minn., Wednesday, August 26.

Benson, Minn., Thursday, August 27.

Cokato, Minn., Friday, August 28.

Gravity, Ia.—Farmers Mutual Telephone Company is improving its plant, with an American Electric board.

Utilities as Unit to Public

Public Groups Utilities' Problems and Service—Says Co-operation Between Utilities Vital Factor in Good Management—Effect of Team-Work on Financing

By JAY G. MITCHELL*

A subject of such eminently practical character, "The Value of Cooperation Among Public Utility Companies," is as great as the value of cooperation has been demonstrated to be in other fields of human endeavor, plus additional worth and strength due to an intimate contact with all elements of the industrial and social world that is unequaled in any other industry.

A proposition may sometimes be more readily analyzed by the examination of its converse. The converse of cooperation is significantly expressed by the common antonyms of the word, which are antagonism, competition and opposition. These words, of course, bring promptly to mind the things which cooperation is not; the things which effective cooperation will eliminate; and the aspects of the public utility industry which pride as well as enlightened self-interest would rule should be abolished.

As civilization advances, the primal impulses are subordinated more and more to the calm dictates of reason, and some careful observers profess to see the possibility of greater progress in the future in proportion to the successful pooling of constructive effort in all fields of human effort, including commerce and industry. The underlying idea is by no means of recent discovery. It has been endorsed by thinkers of every age. Thousands of years ago, Homer said, "Light is the task when many share the toil," a very comprehensive statement of the argument in favor of cooperation in general.

Individual departmental organizations of the same concern can conserve their own efficiency and promote the objects essential to success only by working in conformity with the activities of other departmental organizations, by cooperating in every possible way. Each enterprise will attain its object most satisfactorily when conducted in accordance with policies which dovetail with the interests and activities of other enterprises in the community.

The first of these statements will not be questioned by any one here. The second is "begging the question," but it is proved by the tremendous growth and power of those civic organizations which, under one plan or another, secure the cooperation of diverse commercial and industrial interests without, in most cases, any more definite plan than the bare idea of inter-support and cooperation. Such cooperation is not and in fact is not claimed to be altruism; it is hard-headed, result-getting management.

These general industrial enterprises with which we are all connected are, with one exception, approximately 50 years old. The exception is not material because the gas industry is itself only approximately 100 years old. It may be truthfully said, therefore, that all the public utility industries are of recent origin and have been evolved from the earliest beginnings simultaneously with the industrial revolution which followed and was caused by the invention of the steam engine. For this reason, a development has taken place in these industries within the space of a few generations, which is comparable with similar development in the older industries extending over many years or even centuries.

The services of the public utility companies are so thoroughly interwoven in the industrial and social fabric that the individual customer, so far as general policies are concerned, is entirely merged into the entire community. The rise in the standards of living in the last few decades is due to the public utility services and to medicine.

They are taken as a matter of course by the individual citizen, and, whether we approve or not, they are associated in one group in his mind. For this reason the public deals with the public utility companies, not as an individual customer of a single business, but as one of a great number of people, all buying the same kind of commodity and subject to the same tastes. It is because of this public attitude that regulatory commissions are the rule rather than the exception in our business.

Public Views Utilities as Unit

The condition seems to be logical and to be capable of satisfactorily meeting the situation, and there is no disposition to question its wisdom, so far as I know, but it is the most insistent argument in favor of cooperation among public utility companies that could be advanced. Certainly it is unthinkable that the public may be permitted to view the agencies which supply telephone service, electric light and power, gas, water, and transportation as antagonistic, competitive, or opposing in respect to one another, without doing damage to the consistent, satisfactory relations with the public which are so essential to success and good service.

The very character of the public utility business has developed an intimate interdependence with the industrial and social life of the community. This has interwoven the interests of the customers of the public utility companies on the one hand with the interests of the company itself on the other. Because of this the public has an intimate interest in the details of management and operation. This fact affords one of the most impressive arguments in favor of cooperation, because it is a condition pertaining to all public utility enterprises without exception.

Any public utility company may well see that its public is fully advised as to the similarity in the essentials of operation of all public utilities, except for certain arithmetical points of divergence in plant values and rate structures; that it is advised regarding the enormous capitalization required, the inevitably slow turnover, the stable revenues, and the market unaffected by adverse general conditions.

The stock and securities of all public utility companies have proved themselves to have certain inherent elements of strength not duplicated by the stock and securities of any other industry. Investors, both large and small, are assuming financial interest in the public utility companies for this reason.

These qualities are found in the industry as a whole and are due to the character of the business. Because this fact is bound to result in a more complete association of these enterprises together in the investor's mind and because the problems of management and operation, speaking generally, are identical, cooperation in every possible way would seem to be not only advantageous but imperative.

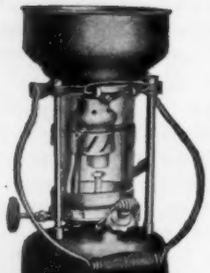
The advantages of cooperation

*Before Public Service Speakers' Bureau of Illinois.

The WALL "DREADNAUGHT"

Powerful Generator — Blue flame cannot be beaten.
Double Valve Pump — Holds pressure for weeks.
Steel Tank — All connections brazed with hard brass spelter solder.
Angle Handle — Restful to the operator.

WALL SUPERIOR PRODUCTS SINCE 1864



Telephone Men Like Them —

because of their safe brazed all steel construction, high heating qualities, low fuel consumption and because they are guaranteed.

After most rigid competitive tests under actual working conditions, these torches and furnaces have been adopted by many large companies for telephone, electrical construction and cable work and are now used exclusively by them.

P. WALL MFG. SUPPLY CO.
3126-66 Preble Ave., N. S.,
Pittsburgh, Pa., U. S. A.
Since 1864

WALL PRODUCTS for INDUSTRIAL USE

STANDARD
Telephone Cables

are manufactured from the best materials by skilled workmen. They embody the most advanced ideas in telephone cable manufacture.

If interested in dependable cable at a reasonable price, write our nearest office.

Standard Underground Cable Co.

BOSTON NEW YORK PHILADELPHIA WASHINGTON PITTSBURGH DETROIT CHICAGO ST. LOUIS SAN FRANCISCO

THE "STEWART" TEST SET

Locates those troublesome lightning grounds with ease, even grounded inside wire. Tells which way and how far to trouble, grounds crosses and shorts, thus making it not necessary to visit every house on a line when a line is grounded in the carbons. A two-minute test will often eliminate more than half the houses on the line.

Sent on 10-days trial.

STEWART BROTHERS
MAKERS OF TESTING INSTRUMENTS
OTTAWA, ILL.

among public utilities, therefore, are those advantages which may most fully develop by the intensification of logical and tried policies, and the policies that have been found to be logical and have stood the test in one public utility company may, in most cases, with very simple modification, be found effective when applied by another. One of the most obvious channels through which such cooperation may be realized is the consistent presentation to the public of the essential facts common to the entire industry.

The general public is entitled, because of its intimate interest, to the most complete and accurate information that it is possible to impart. This is true when the public is viewed as the consumer of the product and the source of the revenue. It is also true because the public is not only the consumer of the product and the source of the revenue but also the owner of the stock and securities to a constantly increasing extent.

Boost Investment Standing.

One of the advantages of cooperation among public utility companies is the added weight accorded to the popular endorsement of the public utility as an investment when the companies cooperate effectively in presenting the merit of their stock and securities.

Cooperation among public utility companies operating in the same territory will be found to be of tremendous value in matters of local management and operation. In such cases, numberless concessions may be made without delay and with the result of reduced expense. It is in the field of local operation that the greatest material benefits can be demonstrated by cooperation, but it is in the general field of public utility operation and management that the greatest and most valuable intangible results may be realized.

In Illinois, the machinery for cooperative action is available to every utility, large and small. This machinery has achieved a very notable success in the field of constructive publicity. The Illinois Committee on Public Utility Information, which is about six years old, started from very small beginnings and pioneered the way for the whole industry until its general plan has been adopted in 35 other states.

In addition to the Illinois Committee on Public Utility Information, there is the Public Service Speakers' Bureau. This agency affords the finest possible opportunity for initiating and building up a cooperative relation between the various public utility executives.

One of the prime advantages of cooperation will have been realized when the several companies in a given territory shall have broadened their mutual contact through the participation in the activities of the Public Service Speakers' Bureau. This advantage will be the result of acquaintanceship and of acquired familiarity with the problems of the other fellow.

Western Electric Men Find Lead Treating Method

Chicago, Ill.—R. S. Dean and W. E. Hudson, metallurgists of the Western Electric Company, are credited with having discovered a process for hardening and tempering lead. With commendable caution, the Western Electric Company is not releasing details of the reported discovery until conclusive endorsement of the development and particulars of its practical application, are available.

Chicago, Ill.—Hawthorne Western Electric plant is at work on the largest central office equipment order ever placed, that for the new Ohio Bell building at Cleveland.

Association Advertising to Farmers Endorsed by Publicity Experts

Use of farm paper advertising by state telephone associations, as suggested editorially in TELEPHONE ENGINEER, is given thoughtful consideration by advertising specialists in the small town and agricultural district field.

"It is 1925 out in the country just the same as it is in Chicago, New York or Philadelphia," says the Indiana Farmer's Guide in recommending to utility executives that they give the farmer some intimate acquaintance with the prevailing conditions in the utility business. The Indiana journal comments on TELEPHONE ENGINEER'S editorial by saying:

"Business is much slower than the farmer wants it. It seems difficult to get some industries to understand that the rural citizen is a consumer.

The statement is broad, and, having made it, we wish to make some qualifications. The farm machinery man knows the farmer is a user of separators and does not depend on homemade flails. Many of the automobile companies have learned that farmers drive cars, and they make their advertising plans with this idea in mind. But many other businesses imagine that the twentieth century agriculturist weaves his own cloth and grinds his own grist.

"The point comes to mind on reading the June issue of TELEPHONE ENGINEER. This publication gives some very frank advice to the telephone companies. In part it says: 'If the farmer is to be educated as to what is good telephone service and what it costs to give such service, a medium must be adopted that will place the facts before him. According to a suggestion recently made by a well-informed telephone manager, the medium is printers' ink, and particularly printers' ink that is applied in the production of farm papers. * * * A well-organized advertising campaign in these papers could do much toward improving the service and rate situation of the farm telephone.'

Kansas newspapers are telling the utility story to the state's residents. Copy of this character used by state telephone associations would help greatly to better public relations and assist warranted rate increases

"We pass the question of rates, leaving that for the bookkeepers and engineers. The thing that interests us is that the big telephone companies and many other businesses, too, leave the farmer out of their consideration. With managers city-born, city-trained and seldom seeing the horizon, it is little wonder that they lose sight of that great percentage of Americans who live where the corn grows tall and the tinkle of the cowbell musically takes the place of the rumble of the elevated.

"In this twentieth century the farmer is a purchaser of food, clothing, fuel, building supplies, musical instruments, telephone service, radio equipment, automobiles, books, publications and all things that appeal to the city brother to bring bodily comfort and mental and spiritual uplift. It is 1925 out in the country just the same as it is in Chicago, New York or Philadelphia."

In Kansas, where one of the livest of many live state associations is doing a good public relations job, part of the work of telling the farmers of the problems and services of the telephone companies is being done by the Kansas Daily Newspaper Advertising Association. One of the advertisements run in 23 Kansas daily newspapers is headed "Public Utilities are Pioneers of Progress." Speaking of one detail of the work of utilities an advertisement says, "Theirs is a job of eternal pioneering." Specifically, it says of the telephone company: "A telephone is ordered today. It is needed now. That fact has just been discovered today. The telephone company knew five years ago that the telephone would be needed today. The company planned and built for it some time ago."

H. D. Critchfield, Veteran, Dies in Fall Down Elevator Shaft

Chicago, Ill.—H. D. Critchfield, one of the most widely known of the old guard of Independent telephone men, died in Chicago, August 7, as a result of an accidental fall of 17 stories down an elevator shaft in the Stevens building. Mr. Critchfield, according to testimony at the inquest, stepped from the elevator on to the seventeenth floor. Apparently changing his mind suddenly, he attempted to step back into the car. The elevator operator had neglected to close the door into the shaft when the car was started. Mr. Critchfield fell to his death.

In 1895 Mr. Critchfield began his conspicuous career in Independent telephony as one of the organizers of the Mt. Vernon, O., telephone company. In 1896 he became secretary of the Ohio Independent association and carried on in association work by being chairman of the constitutional committee of the pioneer national Independent association, and member of its advisory board. He became associated with the Everett-Moore syndicate in 1897 and was engaged in this work for four years. Mr. Critchfield's long association with the Automatic Electric Company began in 1901, when he became general counsel for the company. After some service with the Automatic he again engaged in association work to return to the Automatic in 1909, working in a sales promotion capacity. This work continued until 1916, when he was appointed special sales representative for the Automatic.

The growth of his personal interests caused his retirement from active connection with the Automatic in 1922, but he was still retained in an advisory capacity by the company. Mr. Critchfield was interested at the time of his death in some oil properties, having become active in the petroleum industry through one of his enterprises concerned with the introduction of a device for increasing oil well production by melting paraffine and other heavy ends that clog oil sands.

His friends in the telephone industry were numbered by the hundreds and his death, with its untimely close to a career rich in achievement and friendships, has been widely deplored.

Belle Plaine, Ia.—New owners are to rebuild the Belle Plaine plant.

Fountain Inn, S. C.—O. B. and J. W. Givens of Fountain Inn have bought the Fountain Inn Telephone Company from James M. Richardson.

G. D. Dennis in Charge of La Rue (O.) Plant

LaRue, O.—G. D. Dennis, formerly with the Snook-Hillhouse Engineering Co. of Columbus, has taken charge of the LaRue Telephone Company, following the resignation of W. F. Kniffin, for 20 years secretary and general manager of the company. Prior to his engineering work Mr. Dennis was with the Kellogg Switchboard and Supply Company.

Meyer Goebircher, Active Ohio Independent, Dies at Conneaut

Conneaut, O.—Meyer Goebircher, for 19 years secretary and general manager of the Conneaut Telephone Company, died here July 12, after partial invalidism of several years. He was born in Frederick, Md., Dec. 12, 1861. Mr. Goebircher was prominent in business and lodge circles at Conneaut.

One Copy Worth the Cost of Several Volumes

"Herewith check for one year's subscription to TELEPHONE ENGINEER. One article in the sample copy you sent me was worth the price of several years' subscriptions."—J. H. Clymens, Mgr., Aurelia, Iowa.

E. L. Chase, Kansas City, Heads Motion Picture Guild

Kansas City, Mo.—E. L. Chase, prominently identified with the Gary telephone interests, has been made president of the Motion Picture Guild of America.

Brussels, Ill.—Brussels Telephone Company and Batchtown Telephone Company have been merged. Batchtown Telephone Company, Inc., is the new corporate title. T. F. Narup is manager.

Coming Conventions

INDIANA
September 23-24
Claypool Hotel, Indianapolis

U. S. INDEPENDENT T. A.
October 13-16
Hotel Sherman, Chicago

Everstick

Approved by Large Operating Companies For the Following Strains

6" 2-way	2,200 lbs.
6" 4-way	6,000 lbs.
8" 2-way	6,000 lbs.
8" 4-way	10,000 lbs.
10" 4-way	16,000 lbs.

Write for Details

Everstick Anchor Co.
ST. LOUIS, MO.

Superior Rubber and Friction Tapes
Hot Galv. Pole Line Hardware
Cedar Poles, Northern and Western
Victor and Ace Batteries
Radio Equipment

A. J. Johnson Co.
217 No. Desplaines St., Chicago, Ill.
(Tel. Haymarket 9189)

Get your
Telephone Repair Work
done at the old reliable
Telephone Repair Shop
SUTTLE EQUIPMENT CO.
OLNEY, ILLINOIS

SCRAP PLATINUM
Highest prices paid for discarded or obsolete telephone and switchboard apparatus; platinum contact relays, ring keys, etc. Have specialized in this field for many years.
CONTACT METALS CO.
221 E. 23rd St., Chicago

Send for free sample and prices on
UNIVERSAL DROP WIRE INSULATORS
Universal Specialty Company
120-A, S. 7th St., Terre Haute, Ind.

Printed Forms for Telephone Companies
MONTHLY AUDITS
Accounting Systems Installed
Bowdle Accounting System
Cerro Gordo, Ill.

"Using Them Is the Test"

R. W. Glaser plugged into the Kellogg payroll 11 years ago and has been one of the bright and shining performers of the staff ever since. He has been through the mill with Kellogg, doing shop work, installing, and engineering prior to being put on the beat in New York state. Following his successful performance in the Empire domain he was transferred to Illinois, where he has been hitting the ball consistently.

Jay Houghtaling is celebrating his first anniversary as a Kellogg man, but the way that Jay works has most of the natives in his territory in Minnesota thinking that he's been with Kellogg since the glaciers receded. For some time previous to his Kellogg connection Houghtaling was with the Northwestern Electric Equipment Company and in his selling capacity established a reputation as one of the state's foremost salesmen.

Since April 15, 1923, J. R. Spivey has been devoting his time and his talents to making the familiar letters "F. F. V." identify Kellogg equipment as "Foremost Fones of Virginia," instead of the "First Families." Spivey gets away with this expression of his ambition by calling attention to his license to use phonetic spelling. His extensive experience in the industry qualifies him to sit in with the brethren and give real help.

Economy in Joint Pole Use

(*Continued from page* 23)

cerning joint use, there are two which are most likely to arise. They are: "Where is joint use desirable?" and "With what power line voltages is joint use desirable?"

In answering the first question, we can state in a general way that joint use has been found practicable in cities and villages and not in sparsely settled communities. Let us consider for just a moment the difference in characteristics between city and country. In the cities, houses are close together and in the country far apart. Where in rural districts customers are often a half mile distant, in the city the public utility development makes it imperative that each utility reach customers separated by only a few feet. This means that in the city there must be heavier poles, many more service wires, more frequent inspections and higher construction standards than in the country. Consequently vantage that the telephone circuits are

in those congested areas, joint use is desirably viewed from the angle of the advantages to be gained, to-wit: Safety and economy.

In thinly occupied areas, such as rural districts, these advantages disappear. There is no network of service wires to introduce complex conditions and both sides of the highway are generally available so that the electrical supply lines may take one side and the communication lines the other. There are no narrow alleys to complicate the matter of reaching the subscribers as there are in the cities. With the fewer wires needed in the rural districts and consequently fewer and smaller poles, there is not the economy in rural joint use, which, to meet the requirements of the national electrical safety code, would require poles considerably heavier than would be required by either utility on a separate pole line.

In addition there is also the disadlikely to become noisy on account of the inductive effects of the electrical supply circuits.

If rural joint use were created we would have long inductive exposures with open wire circuits at small separations, while in the cities the exposures are short and are generally with circuits in cable.

Next comes the question: "With what power line voltages is joint use desirable?"

Under ordinary circumstances, our engineers have found it practicable to recommend joint use with circuits carrying not more than 5,000 volts of alternating current of 750 volts of direct current.

Telephone protective devices are considered reliable for these voltages or less, and if higher voltages are encountered the engineering problems become very difficult.

This article would be incomplete without a word about "cooperation" as the whole intent of joint use is just

that. After we have agreed with an electrical supply company on the joint use of poles, the effectiveness of that agreement is determined by the amount of daily cooperation which the representatives of both the utilities exercise.

The best of planning will go for naught unless the plan is carried out, and it is up to the men who administer the working of the joint use contract to carry it out by friendly, helpful cooperation.

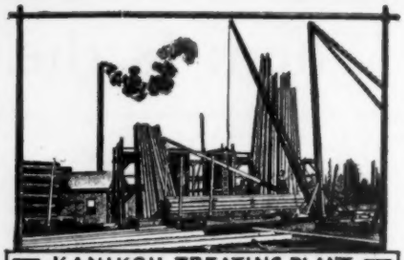
This cooperation of the telephone company with power companies in the joint use of poles is part of the effort to give the best possible service at the lowest possible cost. While a factor which is considered in this plan is the safety to workmen of both public utilities, the main factor is the economy in construction and maintenance.

The telephone subscriber, therefore, is the one who ultimately benefits. Joint use permits the telephone company to give good service, results in the elimination of duplicate pole lines, and shows a saving in the general cost of providing telephone service.

Madison (Neb.) Company Buy Farmers' System

Madison, Neb.—Madison Telephone company has bought the Madison County Farmers' Telephone company which operates in territory not served by the Madison Telephone company's lines. Authority to issue $13,000 of preferred stock, which will be used in purchasing the interests of owners in the property taken over has been asked of the commission. The buyer also desires authority to issue $7,000 more preferred and $3,130 common stock to reimburse the capital account for additions and betterments made and also to finance other additions and betterments.

The last report of the two companies showed that the farmers' company had assets of $23,224, and served 206 subscribers, while the Madison company served 1,062. The latter company recently purchased the property of the Tilden company, operating at the town of that name some 20 miles distant, for $18,000. The company now has stock outstanding of $42,990, assets of $85,748.28, a surplus of $16,886.96 and a depreciation reserve of $23,144.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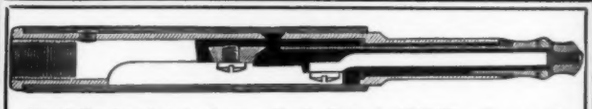
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Machines Replace Men on Jobs

Man-Power No Longer Heaviest Factor in Construction and Maintenance Work—Use of Mechanical Methods Brings About Great Improvement in Plant Work

By G. O. POOLEY

(Superintendent of Supplies and Motor Vehicles, Chesapeake and Potomac Telephone Company)

Up to a few years ago the construction and maintenance of telephone plant was largely dependent upon man power, together with a few small tools which were either carried about in bags or on the floor of some horse-drawn vehicle. The amount of work accomplished by workmen in those days depended on the territory, weather, the physical condition of the workman and the horse's disposition. Today, the construction and maintenance of telephone plant, together with the speed and accuracy of accomplishment, is almost wholly dependent upon man's ingenuity to properly operate machinery and special tools which have been developed to replace manual labor.

The purpose of this article is to show a comparison of some of the methods heretofore employed in outside plant construction and the present-day methods. Owing to limitations caused by lack of space, we will confine ourselves to our major labor-saving devices and describing their uses in contrast with old methods, and in so doing will deal first with aerial plant and then with underground construction.

A typical vehicle of "yesterday" equipped to construct new lines, rebuild and repair existing lines is the horse-drawn truck, or more properly speaking, wagon. This has been superseded by the motor truck. With the introduction of pole derricks, the old method of erecting poles was cast to the winds. The derrick is also relied upon for resetting poles, removing pole butts, setting loading coils and many other uses.

As we became more acquainted with the up-to-date winch-equipped vehicle, many uses other than setting poles were found for the winch and winch line. One is use of the winch as an aid in removing wire. A specially designed collapsible reel is attached to the winch shaft. As many as ten wires may be taken down and coiled in one operation. Former methods required some makeshift hand-operated equipment.

Another use of the winch line was found in taking down cable. Previous methods required hand power, which was very unsatisfactory. A specially designed cable reel trailer is attached to the motor vehicle; an empty reel is placed on the trailer and on one drum of the reel several winch line guides are attached. By the aid of the winch line the cable is pulled to the reel and made fast. The winch line is then wrapped one and one-half times around the drum. A workman holds the slack end of the line taut; the winch does the rest.

Many other uses have been found for the winch line which contribute in a large measure to the safety and efficiency of the crew.

As in the case of aerial plant, labor-saving devices found their way into underground plant construction and today finds us with a hundred per cent mechanical outfit for opening streets, removing dirt, digging trenches for conduit, refilling trenches and building concrete manholes.

The old pick and hand drill method of opening a street for the shovel gang to dig a trench for a new underground run was slow and costly.

Efforts were made to break the surface by the aid of a plow drawn by a Fordson tractor. This procedure helped in a measure to speed up the work and brought about a reduction in the number of workmen previously required, but there were other factors which occasioned further search for some better method. Research to this end brought into use compressed air and air tools, which method from present indications is the last word.

After the street surface had been broken, it was then necessary to loosen the dirt and shovel it out; then after the conduit had been placed and trench refilled, it was necessary to shovel surplus dirt into dump trucks for removal. A considerable saving could be seen if some equipment could be developed to pick up the surplus dirt and load it into dump trucks. Efforts to this end brought into service a loader mounted on a Fordson tractor.

While this loader helped in a large measure, there were several objectionable features to the adaptation of the equipment and in addition there remained that old long-drawn-out pick and shovel method.

Trench diggers were known of, but the best of them would only dig and deposit dirt alongside of the trench. However, one of these was selected and modified to load dump trucks or to deposit the dirt alongside of trench as desired.

This trencher is about eleven feet high with the digging unit above ground, eight feet wide and ten feet long, weighing approximately 12,000 pounds. It is capable of traveling five miles per hour, but in order to gain greater portability, a trailer is used on which the trencher is loaded and towed by a Fordson tractor. The trencher has four digging speeds, ranging from one to three feet per minute, and can

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dig a trench from two inches to four and one-half feet in depth by eighteen inches in width. It will remove stones of considerable size. In one day it dug two hundred and eighty trench feet three feet six inches in depth, loaded surplus dirt on dump trucks and deposited alongside of the trench the dirt required for backfill. It does the work previously requiring fifty workmen.

After the conduit has been placed it becomes necessary to refill the trench which heretofore has been done by a hand-shoveling process. This procedure has now been placed in the discard in favor of a mechanical "back filler" which is being placed into service during the present autumn.

Manhole Construction Easier

It now becomes necessary to provide manholes which in days gone by were constructed of brick. A square or oblong hole was dug by hand tools and lined with brick. A great saving in construction time and improved quality of excavating is done by the trench digger; the dirt is at the same time loaded on dump trucks. A concrete manhole form is assembled in the hole.

Concrete is then poured around and over top of this form. When the concrete has been hardened, the form is dismantled from the inside and its sections are removed through the opening in the manhole. A concrete floor is then laid. The concrete for these manholes is mixed in a "Mixermobile."

This unit consists of a concrete mixer mounted on a Ford 1-ton chassis. The Ford motor furnishes the power to operate the unit. The operator stands on the left side to operate the loader, unloader and power plant.

The unloader chute provides three distributing outlets; one about one-third down, the other two-thirds, and the third at the extreme end. Labor-saving devices, in addition to "lifting the load," add interest to the work and make the job a more pleasant one. In this way a closer relationship is brought about. The fact that more work can be accomplished in a given time creates a greater pride in the work and adds to the joy of accomplishment. There is less likelihood of accidents, proving that labor-saving devices have an additional value. The effect of this factor is appreciated by the workmen and is a morale builder of importance.

Illinois Bell Approves Plant Spending of $18,363,680

Chicago, Ill.—Directors of the Illinois Bell Telephone Co. at a meeting held July 22, approved an expenditure of $4,661,714 for a new plant in Chicago and $1,299,793 for Illinois outside of Chicago. Total expenditures approved for the year to date is $18,363,680.

Eastern Districts in Confab

Pennsy People and Eastern A. B. and C. Units Meet Together

Conneaut Lake, Pa.—Again handling of depreciation and maintenance accounts figured in the foreground as the conference of the eastern district A, B and C member companies of the U. S. Independent Telephone Association was held here, in conjunction with the summer meeting of the Pennsylvania State Telephone and Traffic Association.

The meetings were well attended. About 60 representatives of 35 member companies in Pennsylvania, New York and Ohio were present at the conference, a goodly number at the Pennsylvania summer sessions, and 100 at the operators' conference conducted by Mrs. Mable Pearson Sellvin, chief operator, Jamestown Telephone Corporation, Jamestown, N. Y. John Z. Miller presided over the Pennsylvania sessions, with President MacKinnon of the national Independent association presiding.

Accounting questions were handled by Frank J. Brookman, Rochester's vice president; S. G. Bowie, auditor of the same company, and A. L. Geiger of the Washington office of the national association.

An informal banquet was the entertainment high light of the meeting. W. J. O'Hea of Rochester was toastmaster and brought into the ceremonies such prominent telephone men as Frank L. Beam, Mt. Vernon, Ohio; J. G. Ihmsen, Albany, N. Y., vice president and general manager Up-State Telephone Association of New York; W. S. Paca, Oil City, Pa., vice president and general manager, Petroleum Telephone Co.; W. H. ("Pop") Wilson, Clearfield, general manager, Huntington & Clearfield Telephone Co.; F. L. McKinney, Columbus, Ohio, secretary-treasurer, Ohio Independent Telephone Association; H. E. Bradley, Harrisburg, Pa., president, Pennsylvania State Telephone & Traffic Association; Fred C. Saunders, Wellsville, N. Y., Allegany County Telephone Co.; John H. Wright, general manager, Jamestown Telephone Corporation, Jamestown, N. Y.; and F. B. MacKinnon.

The general comparative summary of financial statistics for Class A, B and C member companies of the national Independent association in Pennsylvania, Ohio and New York for 1916 to 1924, inclusive, follow:

	1916.	1922.	1923.	1924.	1916–1924. Increase.	1923–1924. Increase.
No. of central offices	424	463	457	458	34	1
No. of telephones	283,949	388,889	410,142	436,125	152,176	25,983
Miles of toll wire	.....	.....	21,254	36,635	.....	15,381
Fixed capital	$40,483,364	$57,753,915	$56,831,465	$61,086,718	$20,603,354	$4,255,253
Total assets	45,139,196	64,830,065	64,453,817	70,502,553	25,363,357	6,048,736
Capital stock	18,841,467	27,406,932	28,200,100	31,122,251	12,280,784	2,922,151
Funded debt	15,767,688	17,058,445	16,827,948	20,734,865	4,967,177	3,906,917
Operating revenue	$ 6,388,329	$12,924,200	$13,866,628	$14,788,069	$ 8,399,740	$ 921,441
Depreciation	716,881	1,986,904	2,161,753	2,407,762	1,690,881	246,009
Current maintenance	1,179,345	2,365,263	2,452,056	2,564,602	1,385,257	112,546
Traffic	1,204,998	2,961,963	3,058,298	3,161,490	1,956,492	103,192
Commercial	375,897	908,737	994,527	1,030,796	654,899	36,269
General and miscellaneous	538,697	1,072,850	1,046,321	1,095,040	556,343	48,719
Total operating expenses	*4,037,704	9,295,717	9,712,955	10,259,690	*6,221,986	546,735
Net operating revenue	2,350,625	3,628,483	4,153,673	4,528,379	2,177,754	374,706
All other revenue	785	40,424	115,548	118,313	117,528	2,765
Taxes	$ 300,804	$ 836,319	$ 934,437	$ 1,023,924	$ 723,120	$ 89,487
Other deductions	263,346	373,343	436,925	484,514	221,168	47,589
Total deductions	564,150	1,209,662	1,371,362	1,508,438	944,288	137,076
Income available for interest and dividends	$ 1,787,260	$ 2,459,245	$ 2,897,859	$ 3,138,254	$ 1,350,994	$ 240,395
Interest	838,734	1,050,548	1,113,661	1,135,114	296,380	21,453
Available for dividends	948,526	1,408,697	1,784,198	2,003,140	1,054,614	218,942
Percentages:						
Income available for interest and dividends to fixed capital	4.4	4.3	5.1	5.1	Percentage of increase in No. of telephones:	
Net income to capital stock	5.0	5.1	6.3	6.4		
Interest to funded debt	5.3	6.2	6.6	5.5	1916–24—53.6	
Depreciation rate	1.8	3.4	3.8	3.9	1923–24— 6.3	
Operating ratio	63.2	71.9	70.0	69.4	1922–23— 5.5	

*Expense total does not balance to detail, due to detail information being missing on some companies.

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